Advanced Clean Fuels

Department of Energy Program

Program: Fossil Energy
Office: Coal Technology
Element: Coal Conversion
B&R Code: AA10

Laboratory Complex

Principal Laboratories: PETC
Contributing Laboratories: METC
Participating Laboratories: None

Mission Activity Description

The mission of Advanced Clean Fuels Research is to support development and advance the commercialization of clean, cost-effective coal processing technologies that produce coal-derived transportation fuels, chemicals, and other products, at costs competitive with oil-derived products.

To achieve its goals, Advanced Clean Fuels Research carries out key activities in the following areas:

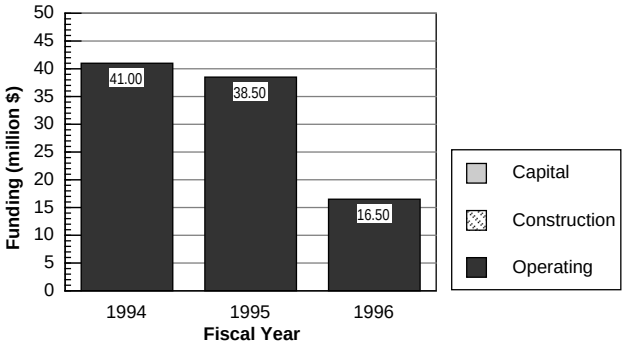
Coal Preparation—The coal preparation program is directed toward the development of coal cleaning technologies that will reduce the ash and sulfur content of U.S. coals so that the products can be formulated into high-quality fuels.

Direct Liquefaction—Direct liquefaction is the catalytic conversion of coal into light hydrocarbon liquids for the production of transportation fuels and chemicals using the existing petroleum-refining infrastructure.

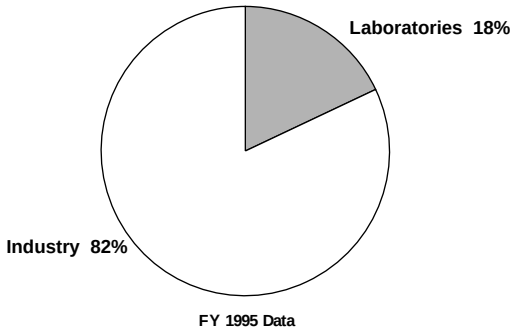
Indirect Liquefaction—Indirect liquefaction is the catalytic conversion of coal-derived synthesis gas into liquid fuels. The products resemble petroleum products that have already been refined and are ready to use.

Coproduction—Coproduction combines indirect liquefaction with an advanced power system to produce both electricity and methanol.

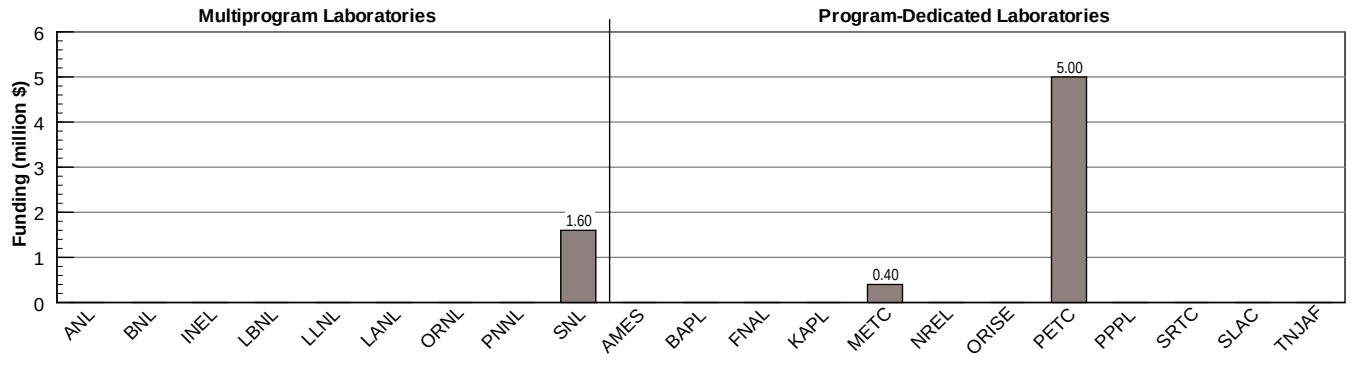
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Advanced Clean/Efficient Power Systems

Department of Energy Program

Program: Fossil Energy
Office: Coal Technology
Element: Coal Combustion and Control Systems
B&R Code: AA20

Laboratory Complex

Principal Laboratories: METC, PETC
Contributing Laboratories: None
Participating Laboratories: Ames, ANL, BNL, LBNL, NREL, ORNL

Mission Activity Description

The mission of the Advanced Power Systems activity is to accelerate commercialization of affordable, highly efficient, low-emission, coal-fueled electricity-generating technologies. To meet this mission goal, the coal research and development program is developing five categories of advanced power systems that hold the greatest promise for commercial use:

Advanced Pulverized Coal-Fired Powerplants—Advanced pulverized coal-fired powerplants take pulverized coal combustion a major step forward by redesigning the process to gain major performance improvements.

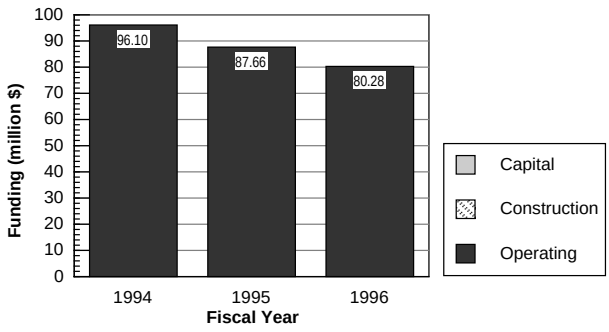
Indirect Fired Cycle Systems—Indirect fired cycle systems are coal-fired combined-cycle systems that produce energy cleanly and efficiently. The high-performance power systems incorporate new high-temperature advanced furnaces that integrate the combustion, heat transfer, and emission-control processes.

Pressurized Fluidized Bed Combustion—Pressurized fluidized bed combustion has several advantages over conventional pressurized combustion powerplants, including the high combustion and heat transfer inherent in fluid beds. The system utilizes combined-cycle power generation to maximize power production.

Integrated Gasifier Combined-Cycle Systems—Integrated gasifier combined-cycle systems replace the traditional coal combustor with a gasifier and gas turbine to provide highly efficient, cost-effective, and environmentally superior means for meeting the needs of the electric utility energy sector.

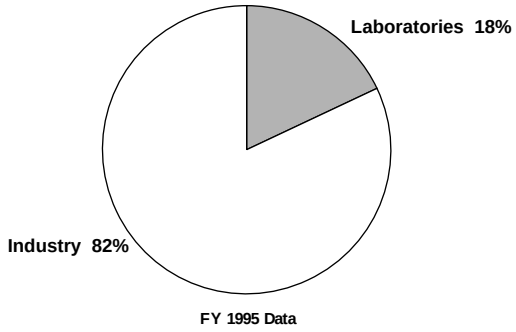
Advanced Gas Turbines—Advanced gas turbines for use with natural gas and coal applications will have ultrahigh efficiencies of 60 percent for utility application, and industrial systems will have a 15-percent improvement over today's best gas turbine system.

Funding History

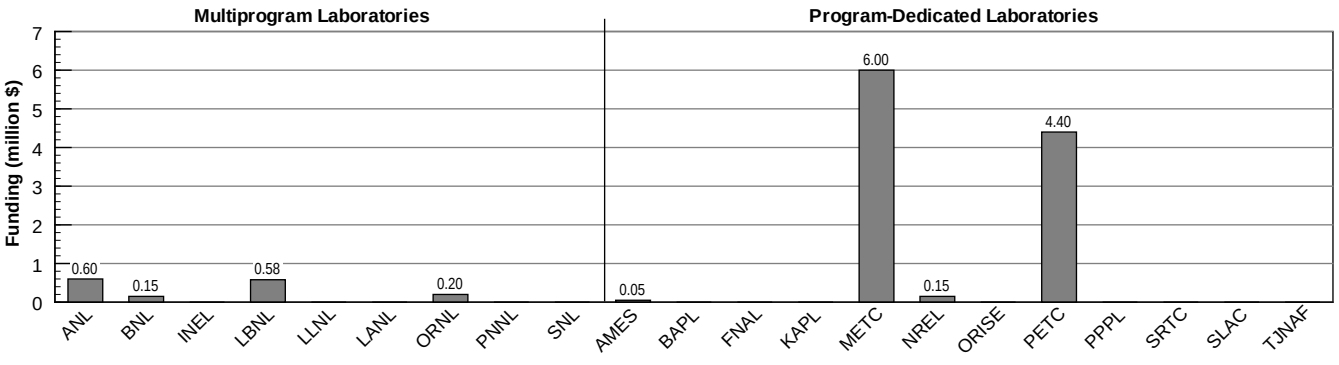


Note: Does not include advanced gas turbine activity, which is funded under Natural Gas.

Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Advanced Research and Technology Development

Department of Energy Program

Program: Fossil Energy
Office: Advanced Research and Special Technologies
Element: Advanced Research
B&R Code: AA15

Laboratory Complex

Principal Laboratories: ORNL
Contributing Laboratories: METC
Participating Laboratories: Ames, ANL, INEL, LANL, LBNL, LLNL, NIPER, NREL, PETC, PNNL, SNL

Mission Activity Description

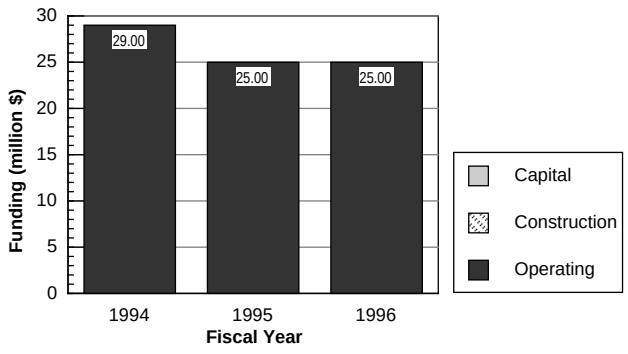
The mission of the advanced research programs is to conduct fundamental and exploratory research to establish the knowledge base necessary for new generations of fossil energy systems. The research products are fundamental scientific data and information to provide the understanding required for new generations of technology and novel new tools, techniques, process concepts, and materials to revolutionize system development. Research topics include coal science, combustion science, advanced materials, biotechnology, separations, catalytic science, and reaction chemistry. The science and technology base that is provided by the advanced research programs is broadly applicable, crosscutting multiple fossil energy systems power and fuel applications—gas-, oil-, or coal-fueled applications. Advanced Research and Technology Development comprises two activities:

Technology Crosscut—This activity supports a set of crosscutting studies and assessments in environmental activities, technical and economic analyses, coal technology exports, instrumentation and diagnostics, bioprocessing of coal, and international programs.

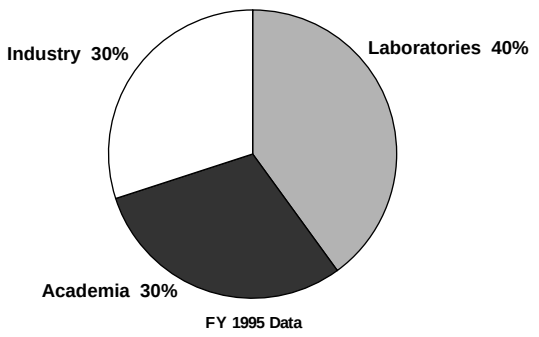
Research—This activity supports research in the following areas:

- **Coal utilization science** focuses on research pertinent to all coal utilization systems, with specific attention paid to increasing our knowledge of the principal mechanisms that control coal combustion processes.
- **Materials and components** research aims to develop advanced structural ceramic composites, structural alloys, coatings, and functional materials to enable development of advanced high-efficiency, economically competitive, and environmentally clean power systems and fuel conversion systems.
- **The university coal research program** aims to support grants to U.S. universities and colleges to conduct interdisciplinary research on the highest priority research needs identified throughout the broad mix of fossil energy technologies that use coal.

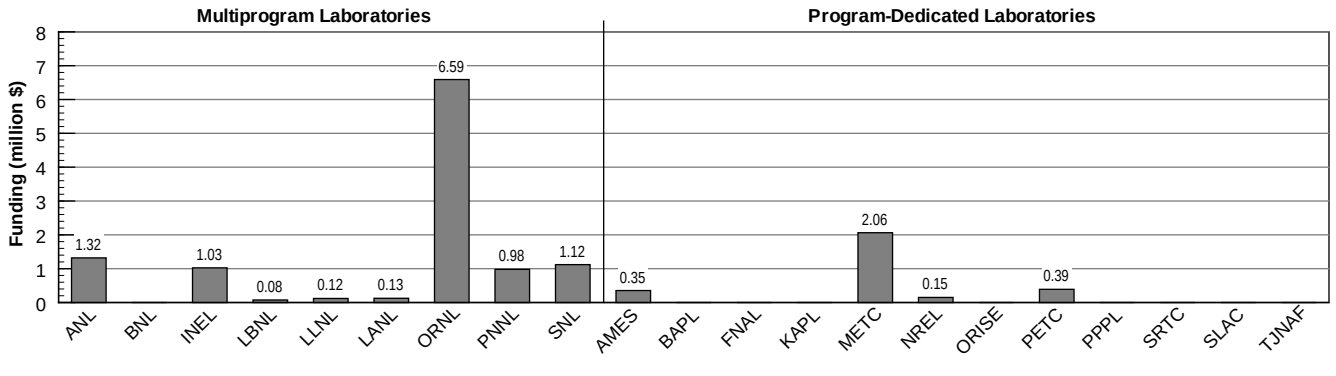
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Clean Coal Technology

Department of Energy Program

Program: Fossil Energy
Office: Coal Technology
Element: Clean Coal Technology
B&R Code: AZ

Laboratory Complex

Principal Laboratories: METC, PETC
Contributing Laboratories: None
Participating Laboratories: ANL, BNL, LANL, LLNL, NREL, ORNL

Mission Activity Description

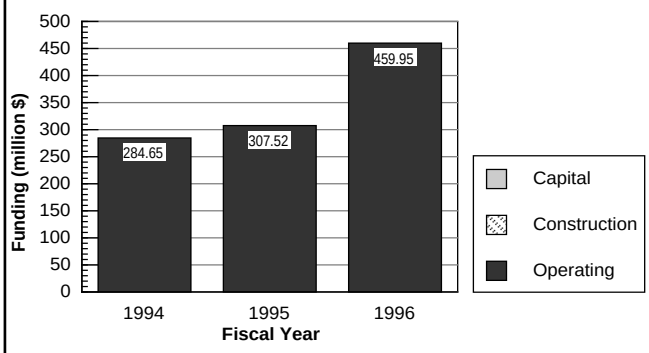
The Clean Coal Technology (CCT) Demonstration Program is an industry/government cost-shared effort to demonstrate advanced coal-based technologies. Most of the demonstrations are being conducted at commercial scale, in actual user environments, and under conditions typical of commercial operations. The technologies being demonstrated are categorized into four market sectors: (1) advanced electric power generation systems, (2) environmental control devices, (3) coal processing for clean fuels, and (4) industrial applications.

The program was administered through 5 competitive solicitations, resulting in the selection of more than 60 projects. The program currently consists of 42 major projects that have been awarded cooperative agreements and 1 project that is in negotiation. The cooperative agreements are administered by the program-dedicated laboratories, METC and PETC. More than 90 percent of the Department of Energy budget for the CCT Program is for direct funding of the major projects through the cooperative agreements.

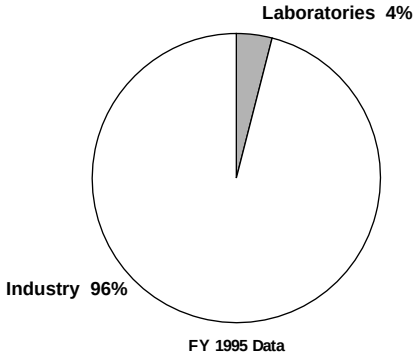
The majority of the task assignments at the multiprogram laboratories are related to the preparation of documentation in support of the National Environmental Policy Act. In addition to activities supporting the act, the laboratories have performed specialized studies and analyses that include:

- The development of a framework that allows the cross-referencing of process and environmental data for process designers and decisionmakers
- General environmental support concerning overall issues arising from air, water, and solid waste pollutants associated with the use of coal
- Analysis of alternative Federal and State market incentives for clean coal technologies, with emphasis on optimal design, implementation barriers, potential economic and financial impacts, and national or regional benefits from accelerated penetration of CCTs
- Development of a pilot training course on state-of-the-art technologies for electrical generation for developing countries

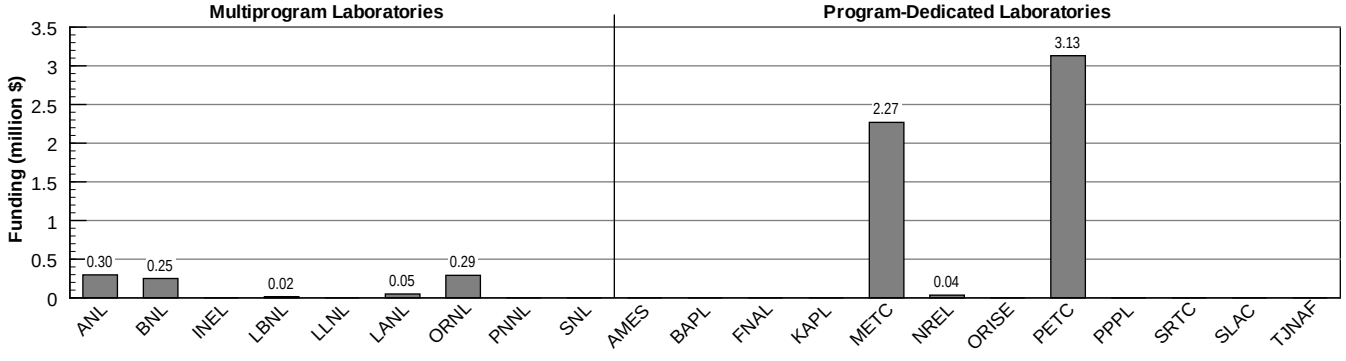
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Natural Gas Research

Department of Energy Program

Program: Fossil Energy
Office: Gas and Petroleum Technologies
Element: Natural Gas Research
B&R Code: AB05

Laboratory Complex

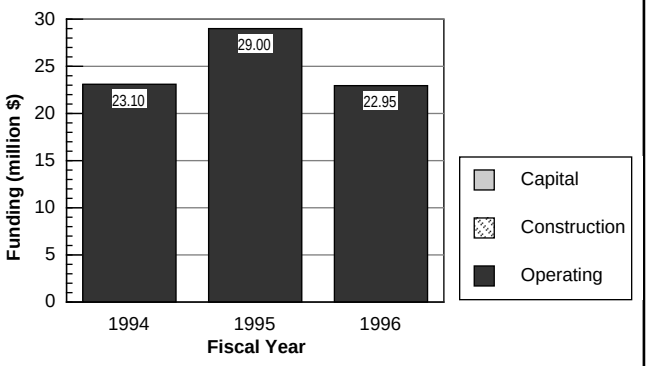
Principal Laboratories: METC
Contributing Laboratories: ANL, INEL, LBNL, SNL
Participating Laboratories: BNL, LANL, LLNL, PNNL

Mission Activity Description

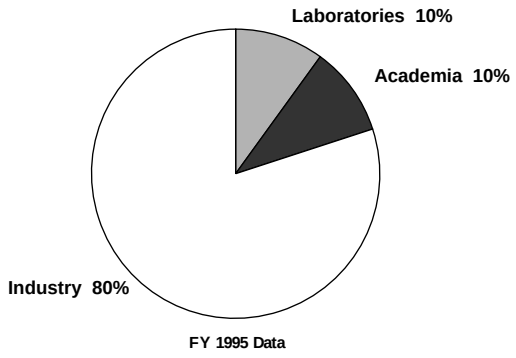
The competitive and clean-burning characteristics of natural gas give it a large and continuing role in the total energy outlook for the United States. To support the DOE goal of expanding the use of natural gas, the Office of Fossil Energy is researching, developing, and demonstrating clean, affordable technologies that will decrease the costs of producing, storing, and using natural gas; increase the reliability of gas supply; and use gas more efficiently. The Natural Gas Research, Development, and Demonstration Program is broken down into four program areas:

- **Resource and Extraction—**Enlarge and stabilize the domestic gas supply reserve base for a period adequate to increase public confidence in the long-term availability of affordable natural gas and to support increased use of gas
- **Utilization—**Develop advanced, high-efficiency, low-pollution technologies for natural gas use and to overcome obstacles to their adoption
- **Delivery and Storage—**Foster more efficient use of gas storage, demonstrate the reliability of peak-load deliverability of natural gas, and assist in the development of an information system for natural gas data that is accurate, timely, and reliable
- **Environmental/Regulatory Impact—**Reduce regulatory barriers to efficient market operations; promote sound, consistent, and efficient regulations based on improved scientific information; and ensure the availability of low-cost environmental technology to industry

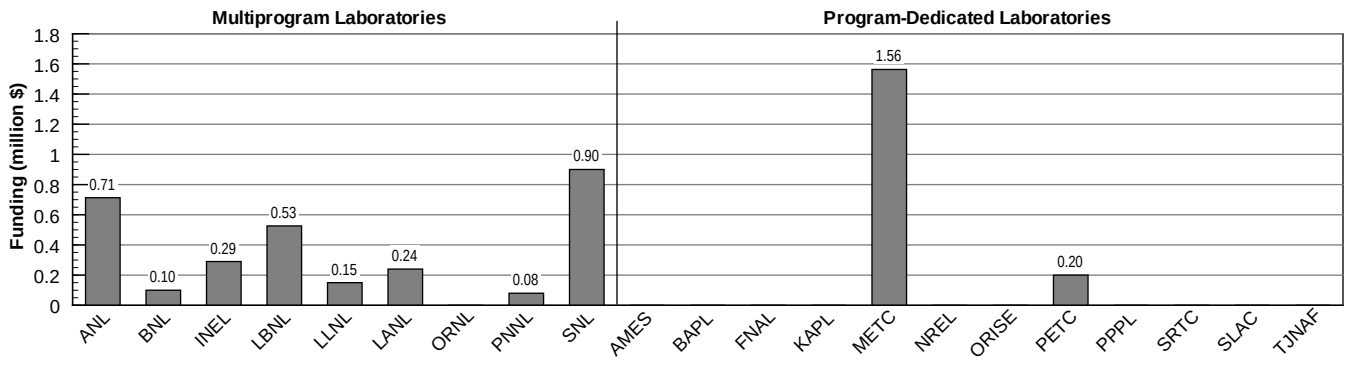
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Fuel Cells

Department of Energy Program

Program: Fossil Energy
Office: Advanced Research and Special Technologies
Element: Fuel Cells
B&R Code: AB45

Laboratory Complex

Principal Laboratory: METC
Contributing Laboratories: ANL, PNNL
Participating Laboratories: None
Note: As designated by the funding program.

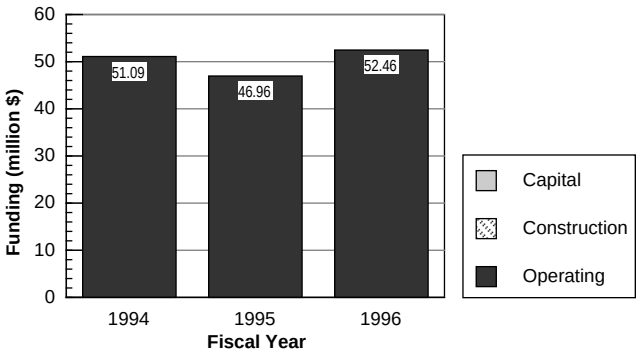
Mission Activity Description

Fuel cell activities focus on research and development (R&D), with the private sector, of cost-effective, efficient, and environmentally desirable fuel cell systems. The objectives are to develop fuel cell power generation systems that can be successfully commercialized in the 1990s by the private sector in utility, industrial, and commercial onsite power generation applications. Fuel cell activities support the Department's mission areas of achieving efficiency in energy, diversity in energy sources, a more productive and competitive economy, and improved environmental quality in partnership with DOE customers.

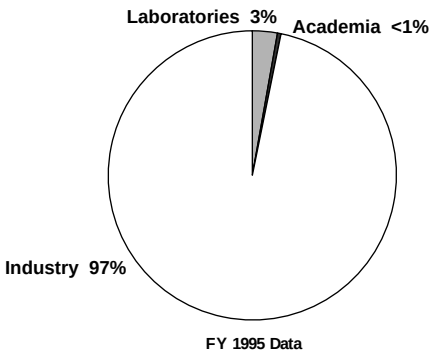
The program fosters basic and applied R&D, proof-of-concept activities, precommercial field testing, and associated private-sector, commercial-scale activity. Key activities include the following:

- R&D of integrated fuel cell systems meeting functional requirements for utility-scale, distributed power, and onsite generation applications
- Development and field testing of performance and durability improvements and cost reduction that would enable private-sector production of competitive market entry powerplants by the year 2000
- Identification and research of advanced fuel cell concepts and configurations that would enable efficiencies of more than 70 percent (on lower heating value basis) and installed costs below $1,000 per kilowatt for utility-scale, distributed power, and onsite generation
- Advanced research that would ensure availability of the critical materials and processes required for commercial market entry units before the year 2000 and advanced units by 2005
- Cooperation with private-sector commercialization activities to facilitate rapid cost reductions and rapid market penetration, enabling industry growth to annual sales exceeding $1 billion early in the 21st century

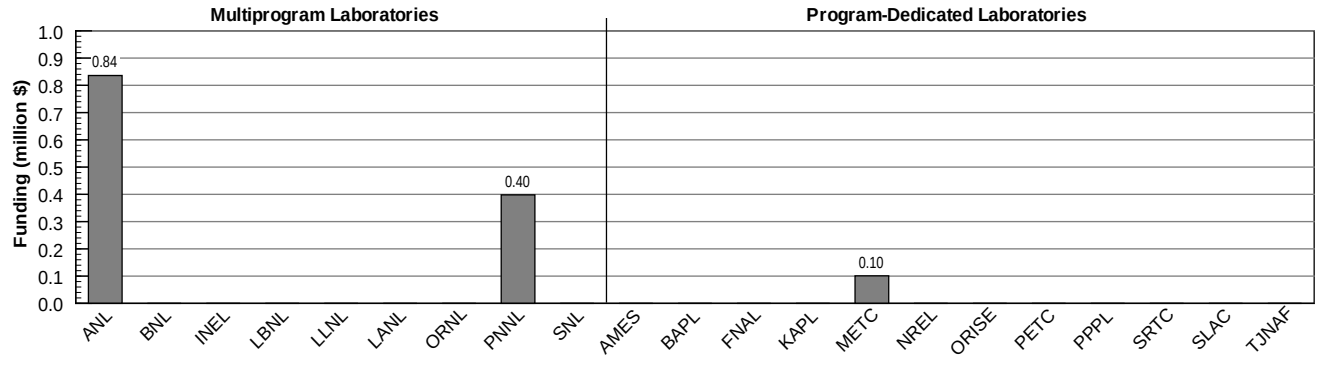
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Oil Technology

Department of Energy Program

Program: Fossil Energy
Office: Gas and Petroleum Technologies
Element: Oil Technology
B&R Code: AC10

Laboratory Complex

Principal Laboratories: None
Contributing Laboratories: INEL, LANL, LLNL, SNL
Participating Laboratories: ANL, BNL, LBNL, ORNL, PNNL
Note: As designated by the funding program.

Mission Activity Description

The mission of the Oil Technology activity is to stimulate the domestic oil industry to maximize the supply of domestically produced liquid fuels and to expand exports of oil-related technologies and services of the United States. The activity seeks more efficient and economical methods to discover, produce, and refine oil while protecting the environment. The Oil Technology activity is broken down into four program areas:

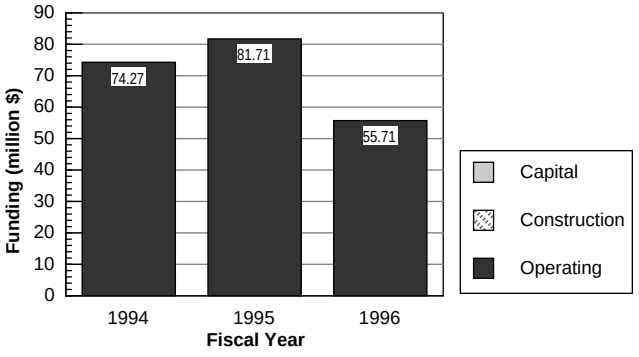
Exploration and Production Supporting Research—Assists in the development of light- and heavy-oil recovery technologies, exploration and production drilling research, risk management, and advanced extraction geoscience activities.

Recovery Field Demonstrations—Extend the economic production of domestic fields by slowing the rate of well abandonments and preserving industry infrastructure, and increase ultimate recovery in known fields by demonstrating better methods of reservoir characterization, advanced oil recovery and production technologies, advanced environmental compliance technologies, and improved reservoir management techniques.

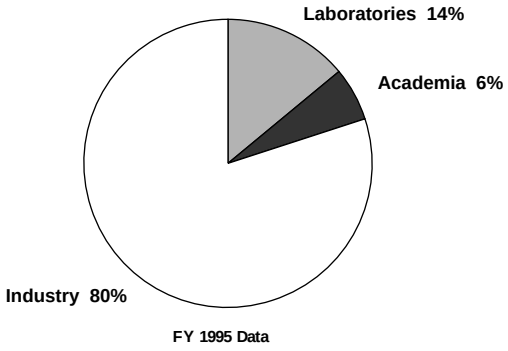
Exploration and Production Environmental Research—Reduces environmental costs to operators while improving their environmental performance, supports State, tribal, and Federal Government officials in making sound regulatory decisions, and promotes better communications with producers to assist them in environmental and regulatory problem solving.

Processing Research and Downstream Operations—Support and plan advanced refining, heavy-oil upgrading technology, and related environmental research. The scope of processing research is moving beyond fundamental research into helping industry deal with the trend toward heavier crude oil inputs and stricter, sometimes conflicting, environmental regulations.

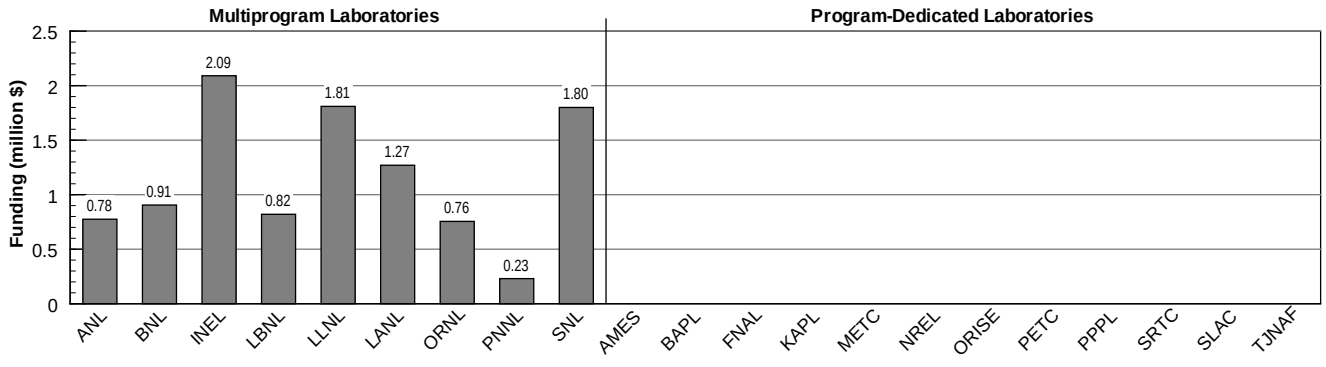
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Strategic Petroleum Reserve

Department of Energy Program

Program: Fossil Energy
Office: Strategic Petroleum Reserve
Element: Technical Management
B&R Code: SA

Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: None
Participating Laboratories: None
Note: As designated by the funding program.

Mission Activity Description

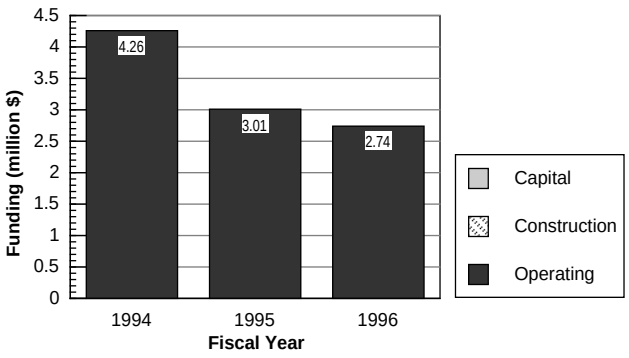
The Strategic Petroleum Reserve (SPR) is a large crude oil stockpile, under the control of the President of the United States. The SPR supports the energy resources mission to "ensure adequate supplies of clean, conventional energy, and reduce U.S. vulnerability to external events." The SPR mission is to reduce vulnerability to economic, national security, and foreign policy consequences of supply interruptions by discouraging supply disruptions as a tool of other nations and by adding to crude oil supplies in the United States, in the event of a disruption due to either political, military, or natural causes. The SPR supports the energy resources goal to ensure reliable energy services with reduced vulnerability to energy price and supply volatility by increasing reliance on risk-sharing mechanisms using a systems approach and promoting flexibility in the energy sector.

The SPR is mandated by the Energy Policy and Conservation Act (1975), as amended, which originally required that a Strategic Petroleum Reserve be established as part of the Federal Energy Administration, a predecessor organization to the Department of Energy.

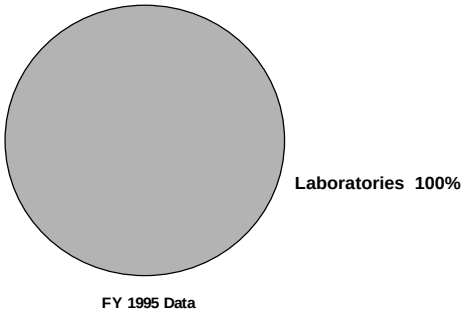
The geotechnical program provides technical, comprehensive, site-specific engineering research and development support to the planning, design, development, and monitoring of the SPR crude oil storage. Key elements of the tasks include geotechnical support for the decommissioning of Weeks Island; support for integrity testing, reviews of underground operations, and geotechnical support; oil quality work in the areas of hot and gassy oil and possible containment monitoring; and cavern mechanics.

The mission of the Reserve requires that each SPR site and terminal be capable of transitioning from operational readiness to full drawdown within 15 days. The engineering research support specifically addresses unknowns and concerns of a geotechnical nature related to development of underground caverns and mines. Failure(s) of the underground storage facilities would result in significant economic loss and inability to withdraw oil when needed and could result in environmental damage.

Funding History

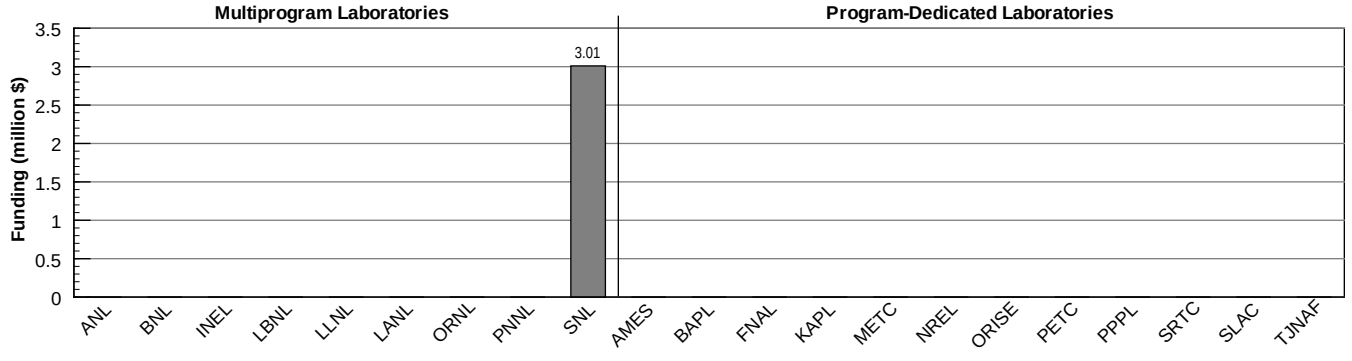


Laboratory-Academia-Industry Participation



Note: Funding for SPRO ($240 million) not included here.

Fiscal Year 1995 Funding Profile



Light-Water Reactors

Department of Energy Program

Program: Nuclear Energy
Office: Science and Technology
Element: Engineering and Technology Development
B&R Code: AF11

Laboratory Complex

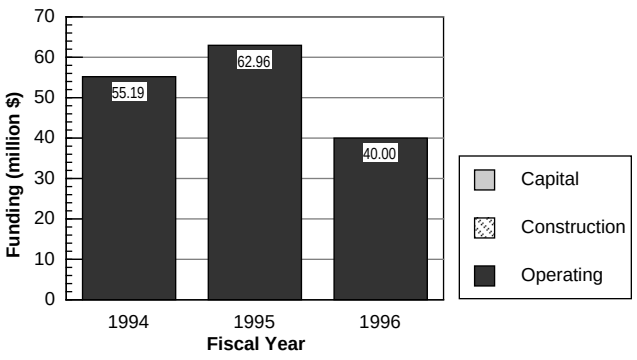
Principal Laboratories: SNL
Contributing Laboratories: None
Participating Laboratories: ANL, ORNL

Mission Activity Description

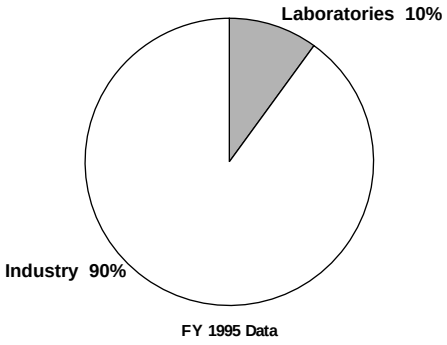
This activity is a nationally coordinated effort to meet the goals of elimination of barriers to efficient and cost-effective operation of nuclear powerplants, and maintaining exacting standards of safety in the design and operation of nuclear powerplants. A major focus of this cost-shared program is to make certified standardized advanced light-water reactors (ALWRs) available at the earliest possible date to ensure that nuclear power is an option to contribute to the new electrical capacity projected to be required by 2010. The program performs those activities necessary to ensure that ALWR orders can be based on marketplace decisions. It demonstrates a viable Nuclear Regulatory Commission (NRC) process by certification of two advanced evolutionary light-water reactor designs. It also develops and certifies the more passively safe, 600 MWe, simplified boiling water reactor (SBWR) and advanced passive pressurized water reactor (AP-600) plant concepts. This program provides for the continuation of the first-of-a-kind engineering (FOAKE) standardization activities to produce ALWR designs. All of the above activities are being carried out in coordination with the Utilities Nuclear Power Oversight Committee (NPOC) "Strategic Plan for Building New Nuclear Power Plants."

The Advanced Reactor Severe Accident Program (ARSAP) provides technology support to existing U.S. commercial operating powerplants and to the ALWR subprogram. It applies the results of the severe accident technology programs to the implementation of the Severe Accident Policy Statement for ALWRs to prevent severe accident issues from forestalling acceptance of ALWRs. The Commercial Light-Water Reactor subprogram develops technology to support the extension of nuclear powerplants' life beyond the current 40-year licensing period. It also contributes to development of the license renewal process.

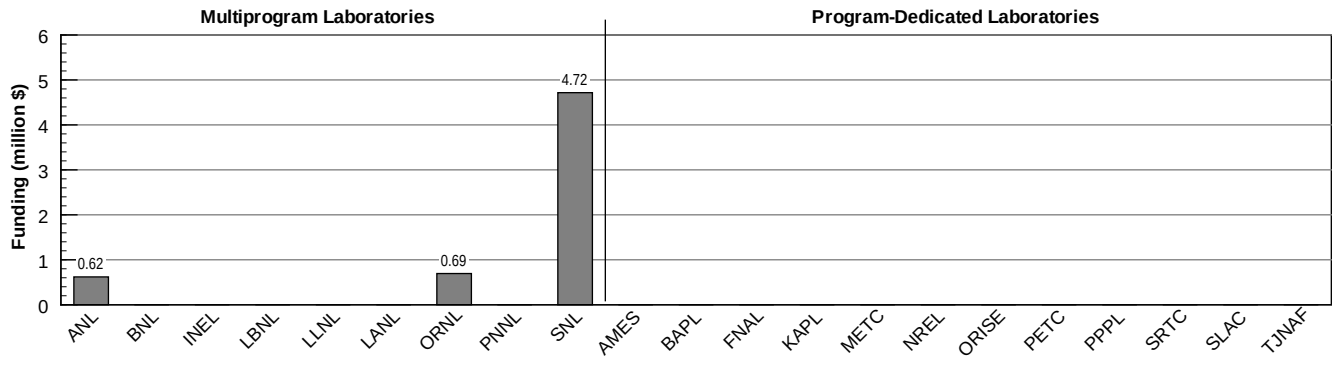
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Advanced Radioisotope Power Systems

Department of Energy Program

Program: Nuclear Energy
Office: Science and Technology
Element: Engineering and Technology Development
B&R Code: AF70

Laboratory Complex

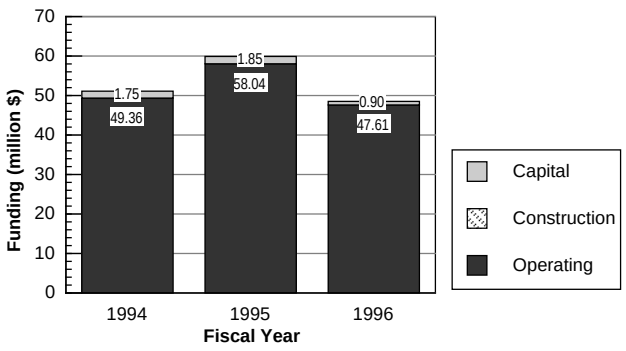
Principal Laboratories: LANL, ORNL
Contributing Laboratories: None
Participating Laboratories: Ames, SNL

Mission Activity Description

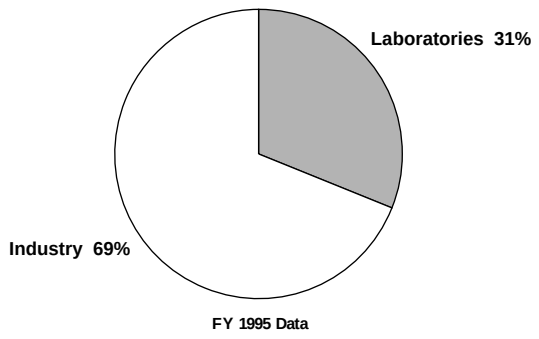
The Advanced Radioisotope Power Systems activity supports the Department of Energy science and technology mission to provide reliable energy resources, meeting important national goals in the areas of energy and national security through partnerships with other Federal agencies, including the National Aeronautics and Space Administration (NASA) and Department of Defense (DOD), and industry.

The Advanced Radioisotope Power Systems program maintains the sole national capability and facilities to produce radioisotope power systems. Program focus is on mission requirements of NASA, DOD, and other agencies. Projects are conducted with these agencies in accordance with memoranda of understanding and are dependent upon cost-sharing by the user agencies. Support is currently being provided to maintain fabrication and safety testing activities for NASA's Cassini mission, scheduled for launch in late 1997. Delivery of three new radioisotope thermoelectric generators (RTGs) and a requalified existing spare unit to the launch site 6 months prior to the Cassini launch is required. This activity supports the acquisition and processing of the required plutonium-238 fuel for Cassini and provides an inventory of flight-quality plutonium-238 for future NASA and DOD missions. This request provides for maintenance of facilities and skilled personnel; modernization and upgrades as required; and provides funding for generic nuclear energy studies, evaluations and safety support. Also provided is support for ongoing special-purpose terrestrial power sources utilized by other Federal agencies.

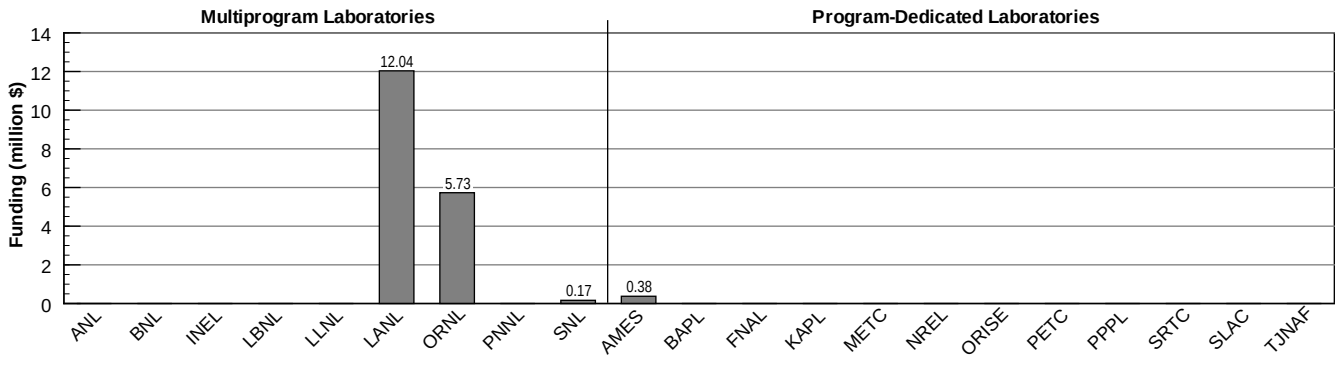
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Nuclear Technology Research and Development

Department of Energy Program

Program: Nuclear Energy
Office: Science and Technology
Element: Nuclear Technology Research and Development
B&R Code: AF50

Laboratory Complex

Principal Laboratories: ANL
Contributing Laboratories: None
Participating Laboratories: None

Mission Activity Description

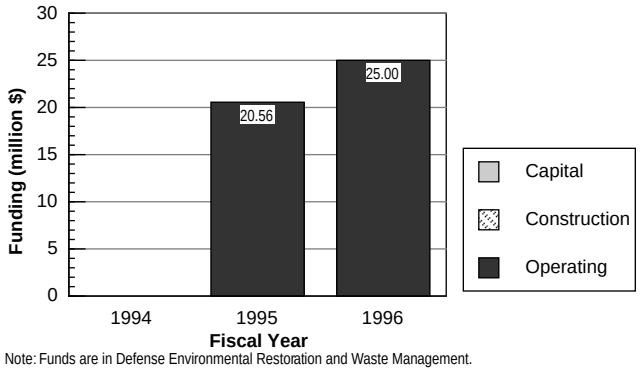
The Nuclear Technology Research and Development (R&D) activity provides funding to support R&D on technologies supporting high-priority DOE missions, specifically electrometallurgical treatment of DOE spent fuels for safe storage and ultimate disposition.

DOE is responsible for approximately 2,700 metric tons of spent nuclear fuel discharged from DOE reactors and in storage at several DOE sites. A standard, cost-effective means for treating this spent fuel for ultimate disposal is needed, and the electrometallurgical treatment process being developed at ANL, which allows treatment of various fuels by one common method, appears to best meet these requirements. This process produces two common high-level waste forms and offers significant cost savings due to commonality of process equipment and consolidation of waste forms. The process has the potential to treat up to 90 percent of DOE's spent nuclear fuel inventory.

The electrometallurgical technology R&D program supports the following activities:

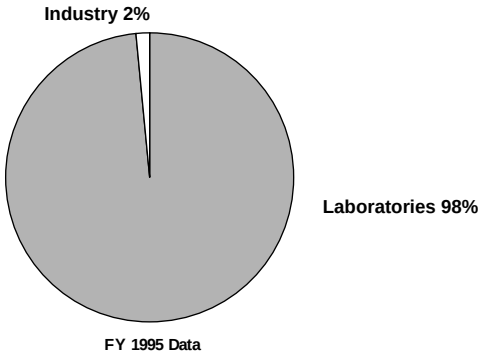
- Continued development of high-throughput electrorefiner to support conditioning of EBR–II fuel and blanket elements
- Continued R&D for treatment of other DOE spent fuel, such as N-reactor fuel and Molten Salt Reactor Experiment (MSRE) fuel, eliminating a current storage safety problem
- Waste treatment R&D and waste form qualification

Funding History

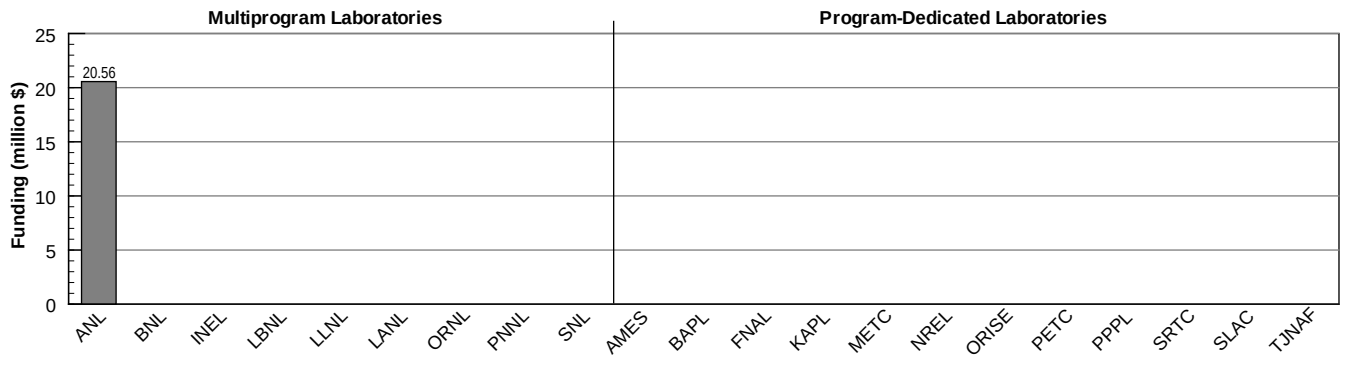


Note: Funds are in Defense Environmental Restoration and Waste Management.

Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



University Nuclear Science and Reactor Support

Department of Energy Program

Program: Nuclear Energy
Office: Science and Technology
Element: University Nuclear Science and Reactor Support
B&R Code: AF40

Laboratory Complex

Principal Laboratories: INEL
Contributing Laboratories: None
Participating Laboratories: ANL, ORNL

Mission Activity Description

The University Nuclear Science and Reactor Support activity provides funding for educational and research grants to help maintain a stable human resource base in the nuclear sciences. The activity also provides funding towards maintaining university reactors used for scientific research, education, and training. The nuclear sciences are an important contributor to the expanding environmental restoration, health, medicine, and research areas as well as to traditional nuclear energy areas. Specific elements of the activity include the following:

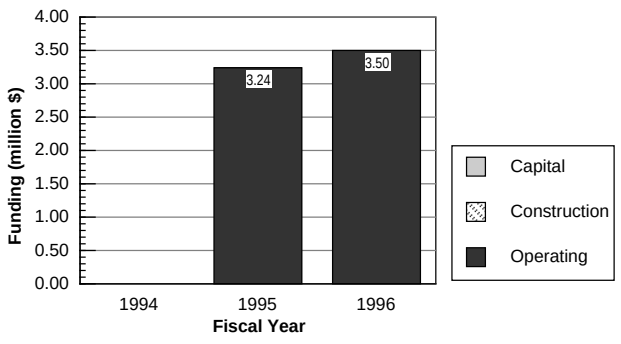
Reactor Fuel Assistance HEU/LEU Conversion—Supports fabrication of fuels for university research reactors and for the conversion of those reactors currently using highly enriched uranium (HEU) to lower enrichment fuels.

University Reactor Sharing—Provides grants that enable universities to make their reactors, ancillary facilities, and staff available to faculty and students from other academic institutions where such facilities do not exist. Under this program, educational tours of the facility are given, classes held, and individual research projects supported. Twenty-eight universities participate in the program.

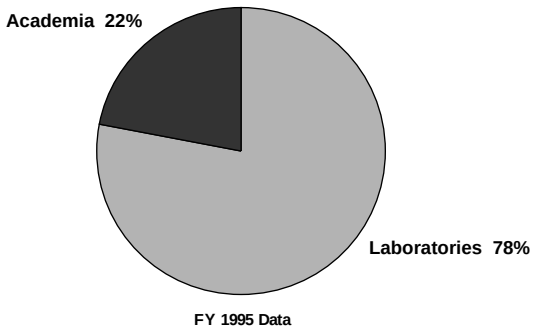
Utilities Matching Grant—Provides matching grants to 17 universities to support undergraduate and graduate education. Funds are matched by contributions from 12 utilities and are used for improving curricula, expanding experimental capabilities, undergraduate scholarships, and research by graduate students.

Reactor Safety Maintenance—Provides funds to upgrade the safety of university research reactors. The university reactors were constructed in the 1950s and 1960s, and many of these facilities, while operating very safely, are nevertheless not using state-of-the-art equipment that would improve both their safety and operational capabilities.

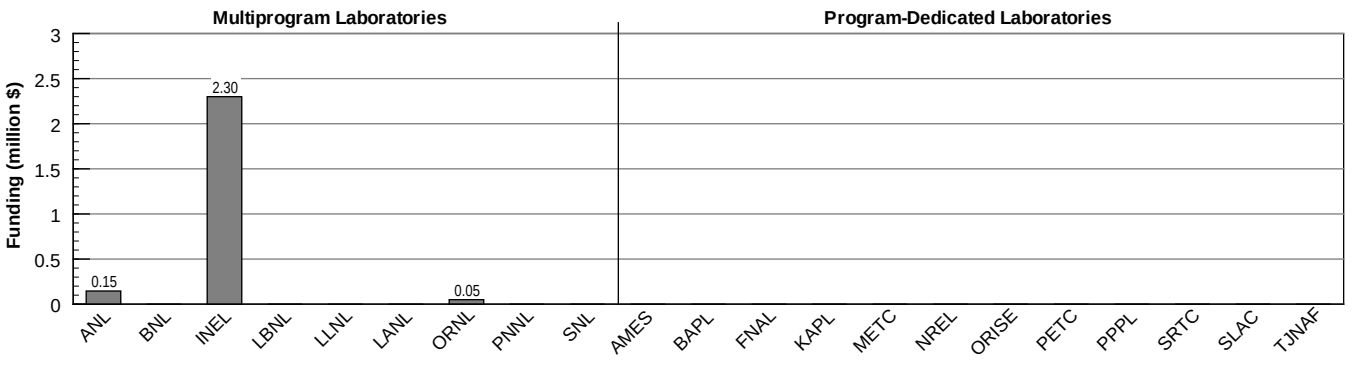
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Soviet-Designed Reactor Safety

Department of Energy Program

Program: Nuclear Energy
Office: Science and Technology
Element: International Nuclear Safety
B&R Code: AF15

Laboratory Complex

Principal Laboratories: PNNL, BNL
Contributing Laboratories: None
Participating Laboratories: ANL

Mission Activity Description

The Soviet-Designed Reactor Safety activity is designed to reduce threats to nuclear safety and the environment posed by the operation of aging facilities in the former Soviet Union and Central and Eastern Europe. The program also conducts activities related to the safety of the Chernobyl nuclear powerplant. These activities are conducted consistent with guidance and policies established by the U.S. Department of State, the Agency for International Development, and the Nuclear Regulatory Commission. Activities include the following:

Management and Operational Safety Improvements—Improve the capabilities of nuclear powerplant operators to establish sound operational procedures and to develop methods for responding to operational abnormalities.

Engineering and Technology Upgrades—Improve the physical condition of the plants, particularly their safety systems.

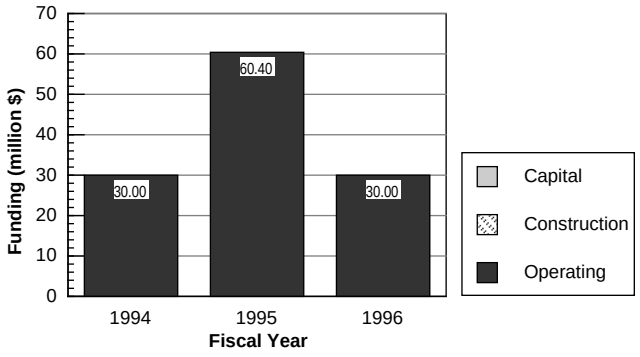
Plant Safety Evaluations—Provide professionals involved in the design, operation, and regulation of nuclear powerplants with the techniques and expertise required to conduct safety analyses that are consistent with Western practices.

Nuclear Safety Legislative and Regulatory Support—Provide assistance to host countries in developing the domestic liability legislation needed to enable a broader involvement of U.S. private industry and establish a strong, independent regulatory authority.

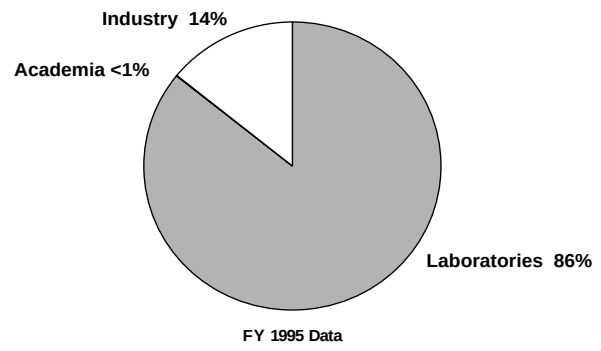
Chernobyl Initiatives—Provide short-term safety upgrades (for example, fire safety equipment) at the Chernobyl nuclear powerplant, and assist the Ukraine in its shutdown of the Chernobyl nuclear powerplant.

Exports of U.S. Nuclear Goods and Services—Promote international nuclear safety, and assist the U.S. nuclear industry in commercial exports. Specific objectives to meet these goals include the following: Support international organizations and specific countries' nuclear infrastructures in achieving increased nuclear safety; organize, promote, and conduct trade missions and export-related workshops.

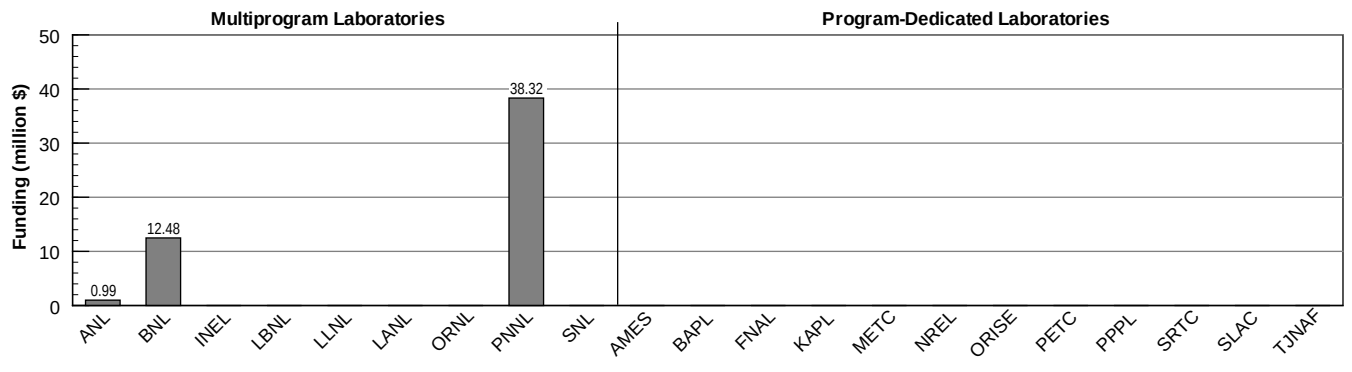
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Facilities and Termination Costs

Department of Energy Program

Program: Nuclear Energy
Office: Science and Technology
Element: Facilities
B&R Code: AF80, AF85, AF89, AF95, AF99

Laboratory Complex

Principal Laboratories: ANL
Contributing Laboratories: None
Participating Laboratories: INEL, ORNL

Mission Activity Description

The Facilities and Termination Costs activity supports facilities and landlord activities including test reactor area (TRA) landlord, Advanced test reactor (ATR) fusion irradiations, Oak Ridge landlord, TRA hot cells, and termination costs. (In FY 1996 and FY 1997 funding previously provided in the Facilities account is included in the termination costs decision unit.)

Test Reactor Area Landlord Activities—Test reactor area landlord activities include operating support equipment procurement; general plant projects and line item capital projects to ensure the safety and reliability of TRA site facilities; correction of TRA environment, safety, and health deficiencies. TRA Landlord supports the DOE isotope production program and the Advanced Test Reactor, which is vital to the Naval Nuclear Propulsion Program.

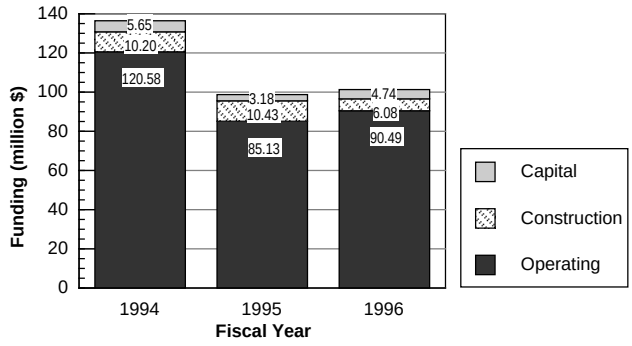
Advanced Test Reactor Fusion Irradiations—ATR fusion irradiation activities provide for the design, fabrication, and installation of an irradiation test vehicle in the ATR that will be utilized to test advanced materials for the DOE/Monbusho Fusion Energy program.

Oak Ridge Landlord Activities—Oak Ridge landlord activities provide for centralized Oak Ridge Operations Office infrastructure requirements and general operating costs for those activities outside plant fences of ORNL, the Y-12 Plan, and the K-25 Plant.

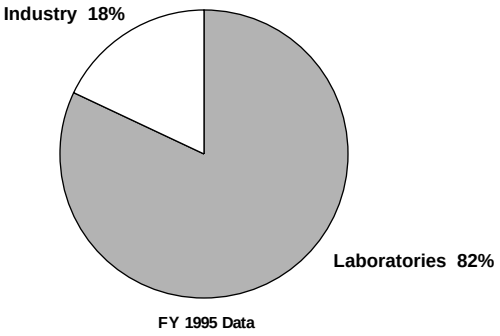
Test Reactor Area Hot Cell—The TRA hot cells at INEL support production of isotopes for medical and industrial applications, fusion materials irradiation experiments, and other DOE programs.

Termination Costs—Termination costs provides for termination of the Gas-Turbine Modular Helium Reactor Program in fiscal year 1996 consistent with the National Academy of Sciences report and the placement of unneeded Office of Nuclear Energy, Science and Technology facilities into an industrially and radiologically safe shutdown condition.

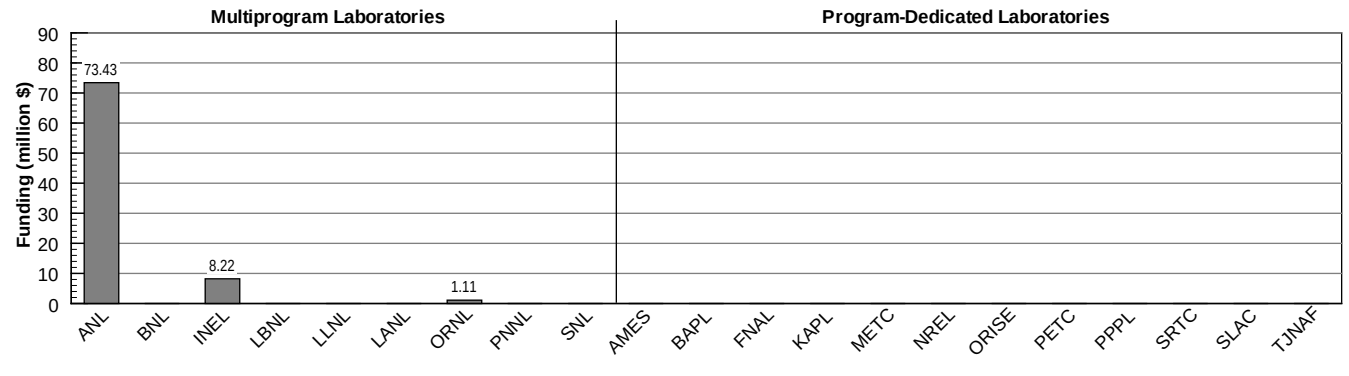
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Nuclear Isotope Support

Department of Energy Program

Program: Nuclear Energy
Office: Isotope Production and Distribution
Element: Isotope Support
B&R Code: ST01, ST02, ST03, ST04, ST05, ST06, ST07, ST08

Laboratory Complex

Principal Laboratories: ORNL, SNL
Contributing Laboratories: LANL
Participating Laboratories: BNL, INEL, LLNL, ORISE, PNNL

Mission Activity Description

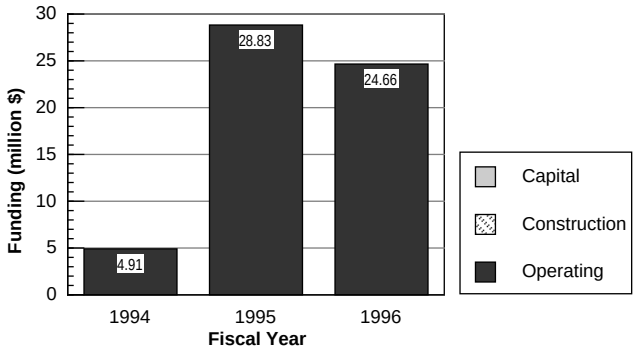
Many uses for isotopes have emerged over the past generation as an adjunct of nuclear research, defense, and power development programs. The very existence of certain industries is dependent on the isotopes produced by the Department. Some examples include: americium-241 for smoke detectors; technetium-99m, thallium-201, and fluorine-18 for medical imaging, yttrium-90 for medical therapeutic applications; iridium-192 for nondestructive testing; and cobalt-60 for sterilization.

The Isotope Program has two primary missions. The first is to produce and distribute certain low-volume radioisotopes and enriched stable isotopes for research and development, medical diagnoses and therapy, and other applications that are in the national interest. The second mission is to produce and distribute high-volume radioisotopes and enriched stable isotopes that have profit potential for medical, industrial, and other useful applications on a businesslike basis, by providing radioactive and stable isotope products and associated services to a widely varied domestic and international market.

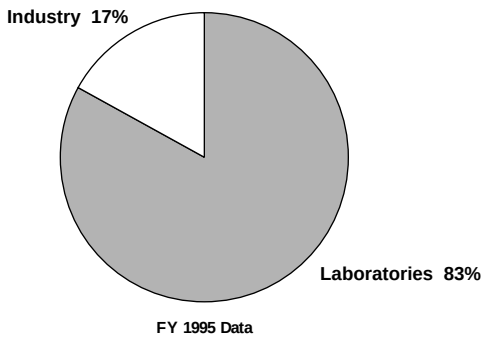
The Department engages in isotope production only when (1) there is no existing U.S. private sector production capability; (2) unique Government facilities are needed; or (3) other productive industrial capacity is insufficient to meet pressing U.S. needs.

A significant ongoing Isotope Program initiative is establishment of a U.S. capability for production of molybdenum-99 (Mo-99) and related medical isotopes. Mo-99 is a precursor of technetium-99, which is used in over 36,000 medical procedures each day in the United States alone. At present, there is no domestic source for Mo-99 and other related medical isotopes that are essential to U.S. health care and research.

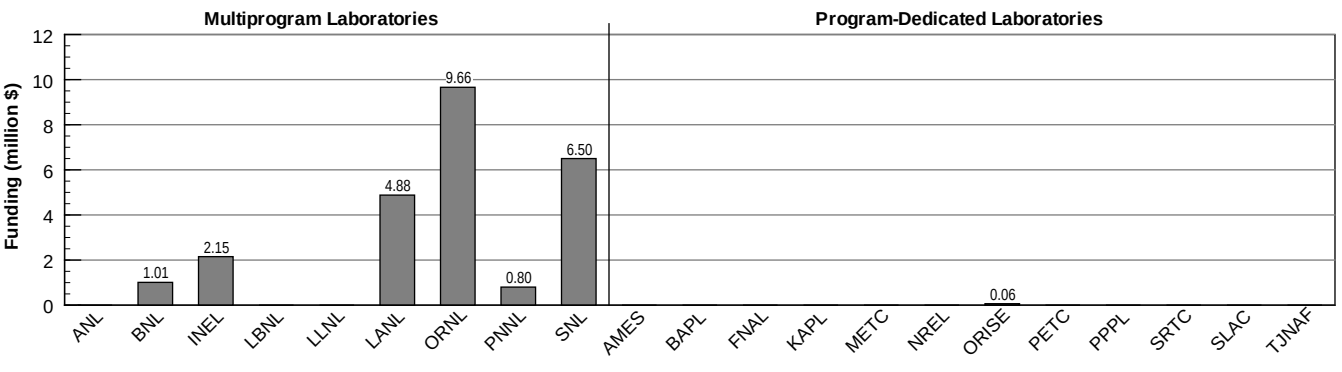
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Nuclear Energy Uranium Enrichment Technology Partnerships

Department of Energy Program

Program: Nuclear Energy
Office: Uranium Programs
Element: Technology Partnerships
B&R Code: CD1009

Laboratory Complex

Principal Laboratories: ORNL
Contributing Laboratories: None
Participating Laboratories: None

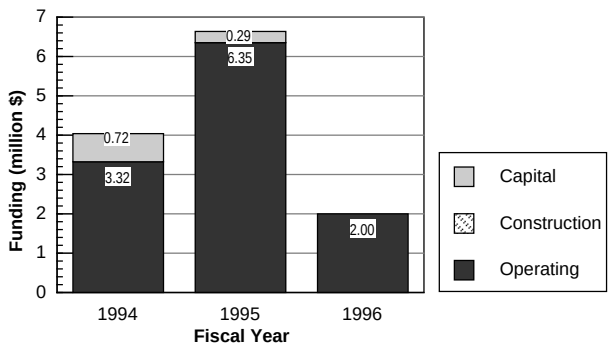
Mission Activity Description

The transfer of DOE-developed derivative uranium enrichment membrane and centrifuge technologies to U.S. industry for nonuranium enrichment applications is a mission of the uranium programs of the Office of Nuclear Energy, Science and Technology. This transfer is facilitated through partnerships between U.S. industry and the DOE laboratory on a 50-50 cost sharing basis (as a minimum) using cooperative research and development agreements (CRADAs) as a mechanism. In the CRADA agreement, the Federal funding only funds the DOE laboratory, and the non-Federal funds normally fund the industry partners' part of the joint work statement. If the case would arise, the private partner can fund the DOE laboratory to accomplish specific CRADA-related tasks through a Funds-in CRADA mechanism.

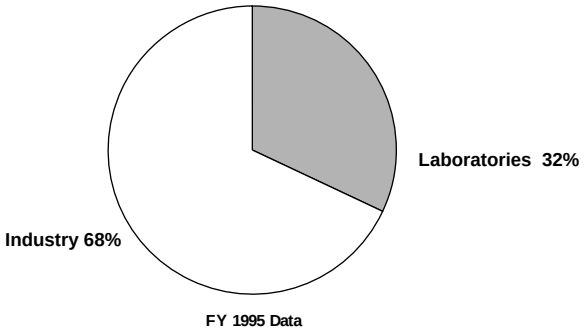
The Uranium Programs are expanding their transfer activities and the number of CRADAs because of increased U.S. industry interest and the significant number of commercial applications and fields of use that offer significant public and private benefits. Uses include such areas as cleanup of radioactive hazardous and toxic contaminates and volatile organic compounds from ground water and industrial processes. Applications in the health field include removal of infectious diseases, bacteria, and virus from air, water, blood, and other human consumables.

The technical goals of the transfer of the DOE-developed technology are to improve U.S. industrial competitiveness through introduction of new products and processes, and to enhance U.S. economic growth and benefits, such as creation of new jobs and increased industrial annual sales. Benefits to the U.S. taxpayer will be realized through licensing royalty payments to the U.S. Treasury.

Funding History

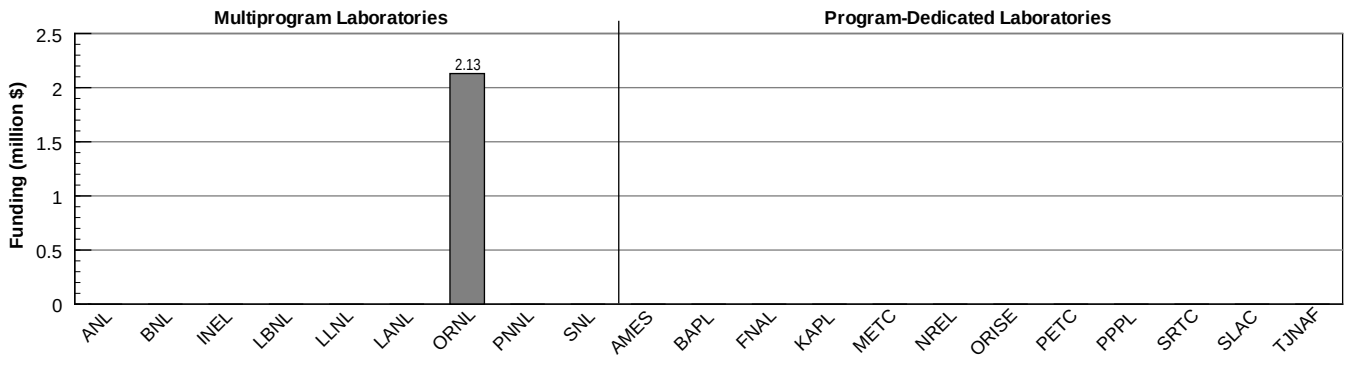


Laboratory-Academia-Industry Participation



Note: Industry partition includes Oak Ridge K-25.

Fiscal Year 1995 Funding Profile



Highly Enriched Uranium (HEU) Transparency Measures

Department of Energy Program

Program: Nuclear Energy
Office: International Nuclear Safety
Element: Transparency Measures
B&R Code: CD1013

Laboratory Complex

Principal Laboratories: LLNL
Contributing Laboratories: None
Participating Laboratories: BNL, LANL, PNNL, SNL

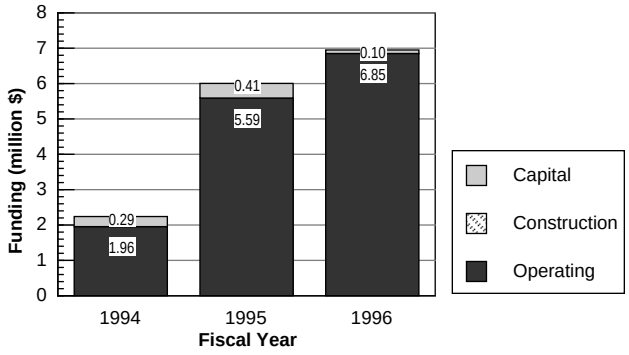
Mission Activity Description

In February 1993, the governments of the United States and the Russian Federation signed an agreement for the U.S. purchase of low enriched uranium (LEU) derived from high enriched uranium (HEU) removed from dismantled Russian nuclear weapons, estimated to have a value of $11.9 billion. Among other things, the purchase agreement calls for the establishment of transparency measures that will provide both parties with confidence that the nuclear nonproliferation objectives of the Agreement are being met.

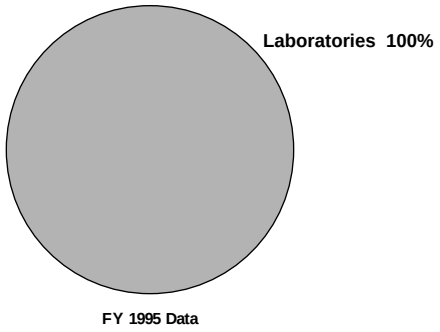
The DOE Office of Nuclear Energy, Science and Technology is responsible for implementing the transparency activities associated with the purchase. Activities include a combination of permanent and special monitoring visits by government and national laboratory experts who have been trained to monitor Russian facilities. Nonintrusive instrumentation and techniques will be developed to improve monitoring credibility. The program will also help to coordinate and provide oversight for the Russian monitoring activities in the United States and will provide assistance to U.S. facilities that are subject to Russian monitoring activities. Assurance that the LEU delivered to the United States under the agreement is fabricated into fuel for commercial nuclear reactors will be accomplished through a combination of declarations by the United States and access by the Russian monitors to the Portsmouth Gaseous Diffusion Plant and the U.S. nuclear reactor fuel fabricators.

The program supports the joint U.S.-Russian Transparency Review Committee (TRC) that develops transparency policy and negotiates the details of monitoring access to facilities, processing, and data, and the possible use of monitoring instrumentation to provide independent measurements. The U.S. participation in the TRC is led by the DOE Office of Nonproliferation and National Security. The Ministry of Atomic Energy (MINATOM) is the entity in the Russian Federation responsible for negotiating all agreements and activities related to HEU Transparency. The Transparency Program managed by the DOE Office of Nuclear Energy, Science and Technology, Office of International Nuclear Safety, implements the transparency activities, develops advanced techniques to provide enhanced but less intrusive monitoring activities, estimates the credibility of procedures, and coordinates the field operations.

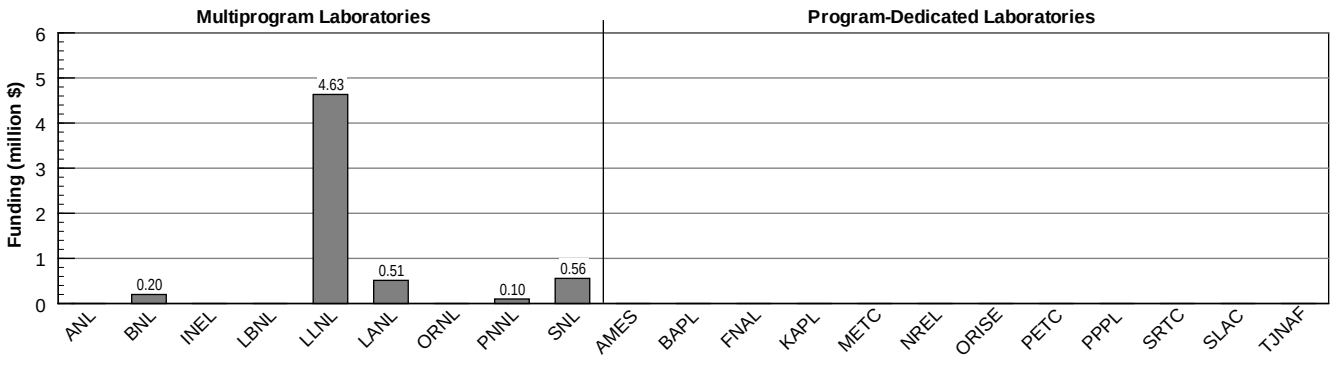
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Solar Building Technologies

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Building Technologies
Element: Building Equipment
B&R Code: EB21

Laboratory Complex

Principal Laboratories: NREL
Contributing Laboratories: None
Participating Laboratories: PNNL

Mission Activity Description

The Solar Building Technology activity works to provide cost-effective use of solar energy for space conditioning, hot water, and electric generation. The goal is to increase the utilization of solar technologies through partnership with industry and end-users.The activity covers a variety of integrated research and deployment activities addressing photovoltaic buildings research, advanced concepts, reliability and maintainability issues, rating and certification procedures, and market conditioning. These include:

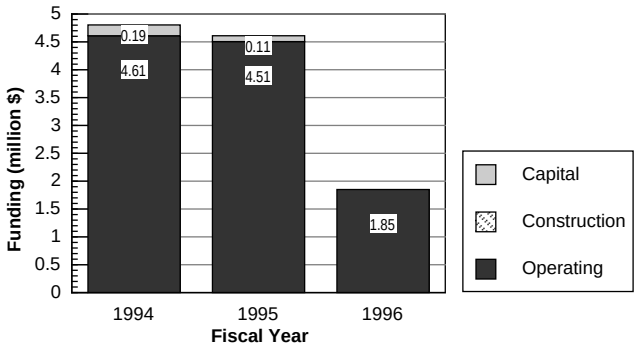
Research

- **Building Integrated Photovoltaics**—Innovative integrated heat, ventilating, and air-conditioning systems, and photovoltaic windows and roof membranes.
- **Reliability/Maintainability**—Technical issues affecting sustained performance of active solar systems.
- **Advanced Concepts**—Advanced materials, components, system design, and manufacturing concepts.

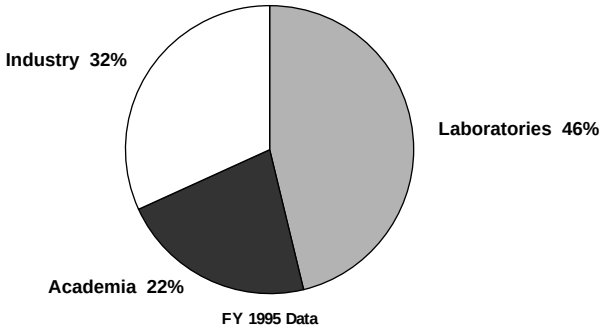
Ratings and Certification—Development of analytical testing methodologies to support industry efforts in establishing voluntary rating and certification procedures for implementation by the Solar Rating and Certification Corporation.

Market Conditioning—Technology deployment efforts supporting specific needs identified by utilities and the solar industry.

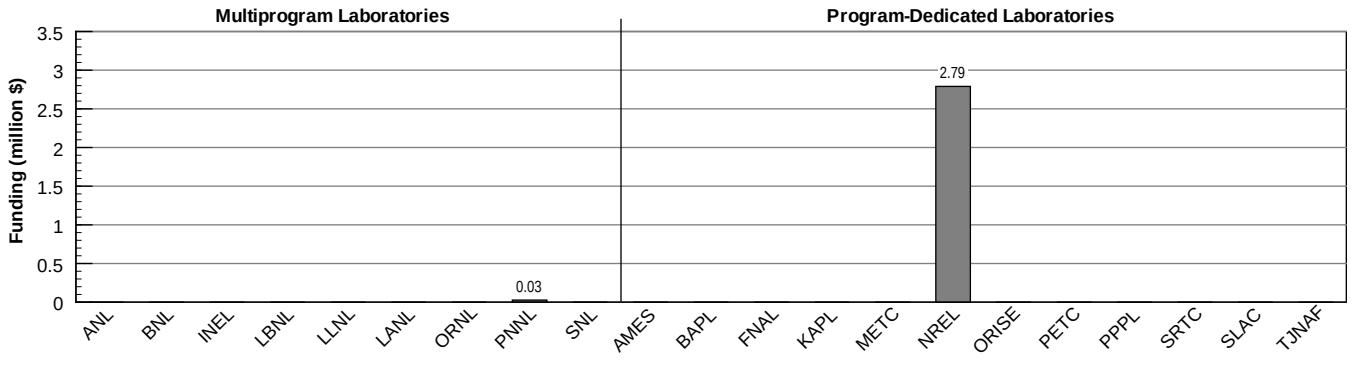
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Photovoltaic Energy Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Solar Energy Conversion
B&R Code: EB22

Laboratory Complex

Principal Laboratories: NREL
Contributing Laboratories: SNL
Participating Laboratories: BNL

Mission Activity Description

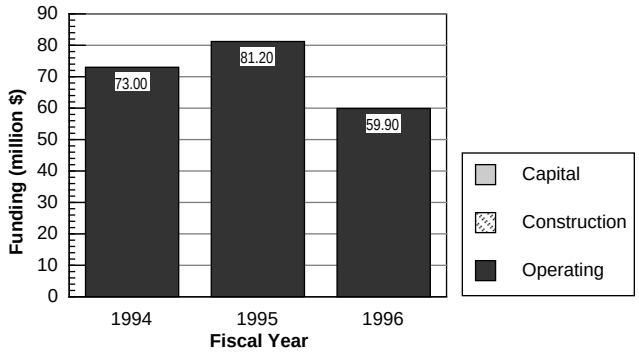
The Photovoltaic Energy Systems activity represents a balanced effort in research (fundamental research, advanced materials and devices, and collector research and systems development), manufacturing engineering, and market development. Representative technologies include silicon wafers of single-crystal or polycrystalline silicon; thin-film materials, such as amorphous silicon, copper indium diselenide, cadmium telluride, polycrystalline silicon, and gallium arsenide-based materials; and high-efficiency, multijunction cells for concentrator or flat-plate arrays, such as gallium arsenide alloys.

Research—Fundamental research activities continue to resolve issues concerned with advanced (post-2000) competitive energy technologies through measurements and performance evaluation activities at universities and Federal laboratories. Advanced materials and devices work continues cost-shared activities with industry to improve device efficiency and stability, particularly for large-area, thin-film deposition systems. High-efficiency research activities investigate multibandgap, multijunction monolithic devices that show promise for achieving concentrator cell conversion efficiency above 35 percent. Module and system reliability research supports environmental testing of photovoltaic modules and systems to improve their operational life.

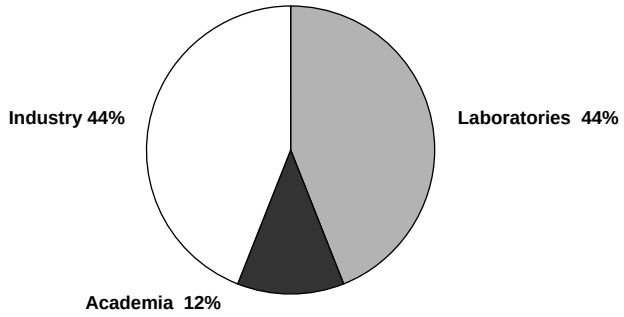
Manufacturing Engineering—Government and industry jointly participate in advancing manufacturing processes and reducing manufacturing costs. The project is expected to reduce the cost of photovoltaically produced electricity by more than a factor of 2, to $0.12 per kilowatthour, in the near term and more than double U.S. industry's manufacturing capacity over that projected without this activity.

Market Development—Market development activities, such as Building Opportunities in the U.S. for Photovoltaics (PV) and the Utilities PV Group, are cost-shared efforts with contractors and utilities to increase the use of photovoltaic systems in buildings and utility applications, respectively.

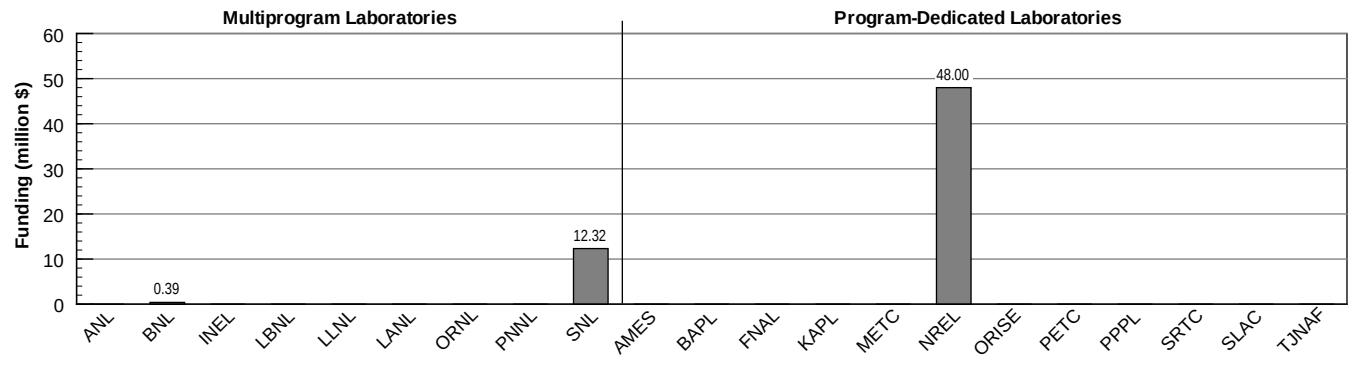
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Solar Thermal Energy Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Solar Energy Conversion
B&R Code: EB23

Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: NREL
Participating Laboratories: None

Mission Activity Description

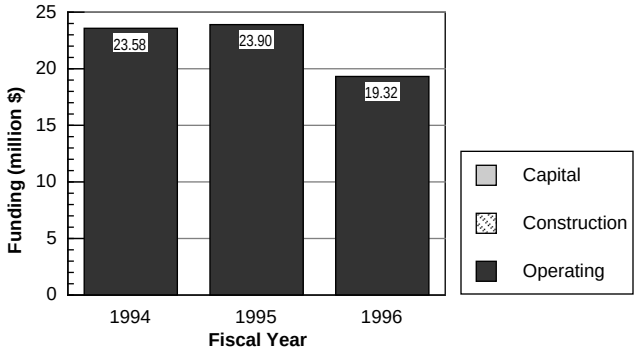
Solar thermal electric (STE) technology works by concentrating large amounts of sunlight onto a smaller surface area to achieve high temperatures, which are then converted to electricity. Currently, there are three STE technologies: power towers, dish/engines, and parabolic troughs.

The mission of DOE's STE activity is to work with manufacturers, developers, and users of STE technology to (1) develop reliable and efficient STE systems that will generate economically competitive power that can reduce our Nation's dependence on foreign energy sources; and (2) proactively support the development of these technologies in order to penetrate markets with new energy applications, thus creating new jobs and business opportunities in the United States and abroad.

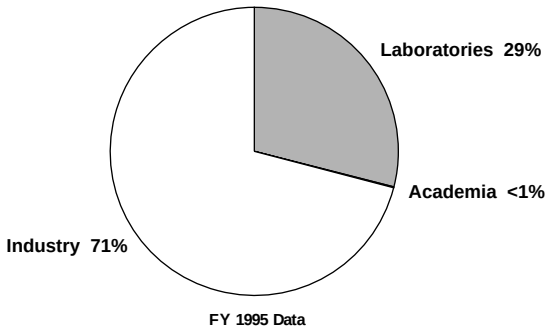
The STE Program, in conjunction with the industry and user communities, has developed a leveraged cost-shared program to support the technology research and development necessary to achieve electric generation costs in a competitive range (less than 10 cents per kilowatthour). Projects include:

- 10 MWe Solar Two Power Tower
- Solar disk/engine systems
- Solar Manufacturing Initiative
- Solar thermal electric applied research and development
- Manufacturing and technical support

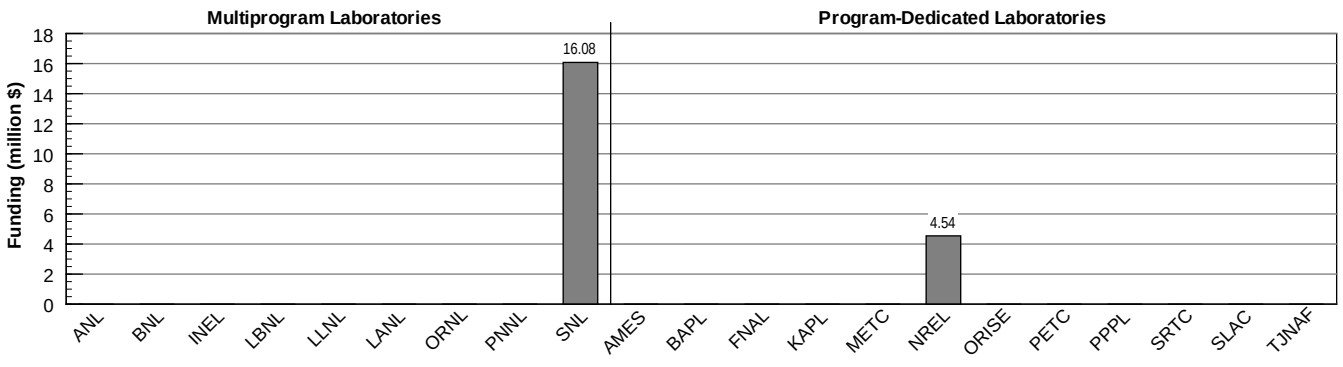
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Biofuels Energy Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial, Utility, and Transportation Technologies
Element: Biotechnology, Biomass Power, and Biofuels
B&R Code: EB24

Laboratory Complex

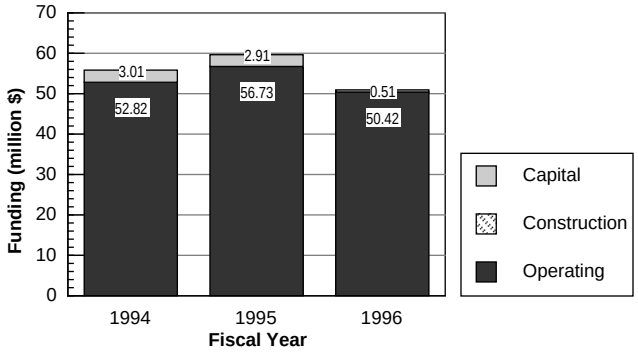
Principal Laboratories: NREL
Contributing Laboratories: ORNL
Participating Laboratories: ANL, INEL, PNNL, SNL

Mission Activity Description

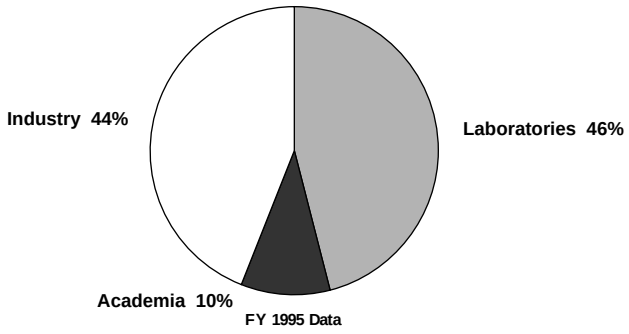
The Biofuels Energy Systems activity provides the technology base necessary for developing cost-competitive systems that can produce energy from biomass. Biomass feedstocks include agricultural residues and forestry wastes, such as rice straw/husks and sawdust, municipal solid waste, and trees and grasses grown specifically for their energy content. Biomass energy can provide products for three major world markets--electric power generation, transportation fuels, and chemical production--and has the potential to provide approximately 33 percent of the total U.S. energy needs in these markets. Biomass energy systems can also provide substantial environmental benefits. Because bioenergy crops absorb carbon when they are growing, their use in vehicles or for electricity production results in very little net carbon release. When these fuels are used to displace traditional fossil fuels (such as coal for electricity generation), significant emission reductions of the oxides of sulfur and nitrogen can also be achieved. In addition, because biomass is domestically produced and is renewable, it offers significant opportunities for job creation, rural economic development, and alternative crop production opportunities for farmers (which can result in a further reduction of Federal agricultural subsidy payments).

The Biofuels Energy Systems activity has five emphases: (1) to develop bioenergy crops and production methods that generate competitively priced feedstocks for use in power conversion and liquid-fuel markets; (2) to develop and deploy biomass conversion technologies that produce power and biofuels; (3) to modify and deploy technologies for use with biomass-derived fuels; (4) to demonstrate biofuel technology; and (5) to assist commercialization and promote market penetration of these technologies.

Funding History



Laboratory-Academia-Industry Participation



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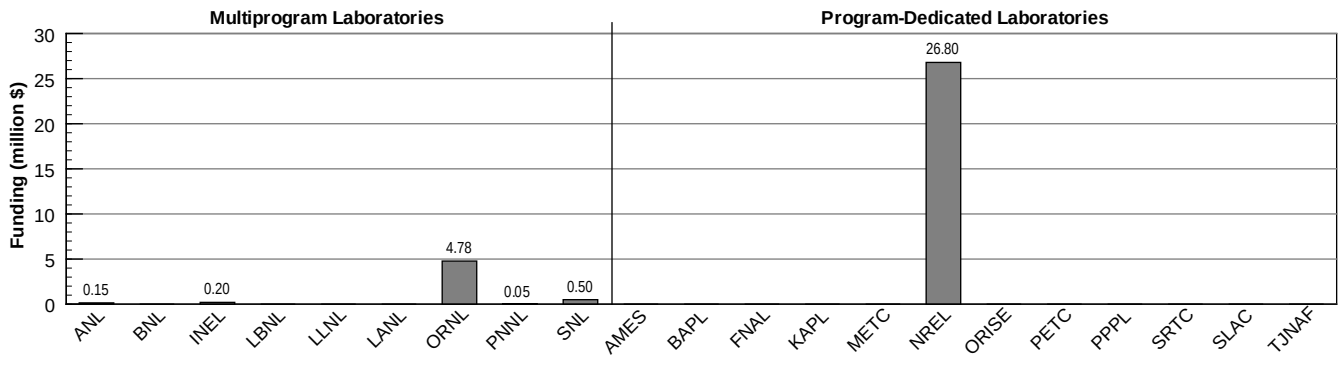


Wind Energy Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Renewable Energy Conversion
B&R Code: EB25

Laboratory Complex

Principal Laboratories: NREL
Contributing Laboratories: None
Participating Laboratories: PNNL, SNL

Mission Activity Description

The Wind Energy Systems activity focuses on advancing wind energy as a cost-effective renewable and pollution-free electric power generation option, and thus directly supports the mission of DOE to achieve diversity in energy sources, a more productive economy, and improved environmental quality for the Nation. Over the last decade, wind technology has improved such that the cost of generating electricity at sites with good windspeeds has been reduced by a factor of 3. The Wind Energy Systems activity supports industry's efforts to further bring down wind energy costs and surmount market barriers, leading to an expected tenfold expansion of exploitable U.S. wind resources, through activities in the following areas:

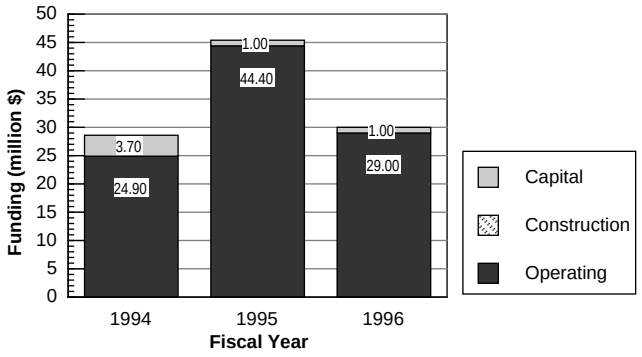
Applied Research—Applied research in wind characterization, aerodynamics, structural dynamics and fatigue, materials, and system dynamics and controls that produce technology breakthroughs contributing to lower wind energy costs. In addition, applied research includes activities to address critical issues for the wind industry, such as avian interactions.

Turbine Research—Cost-shared projects with industry to apply innovative technologies to full-scale wind turbine systems, components, and manufacturing.

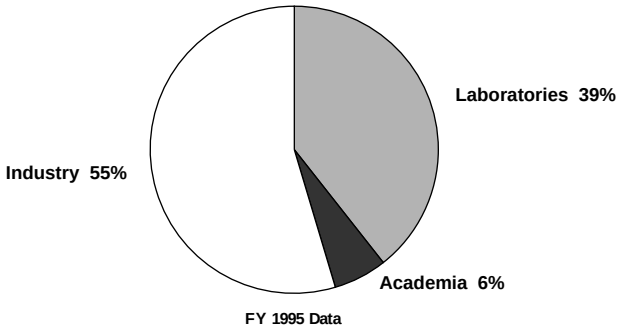
Cooperative Research and Testing—Technology assistance to industry and wind energy users, primarily through the U.S. National Wind Technology Center (NWTC, an international center of excellence for wind energy research, testing, and technical support. NWTC activities include onsite testing of advanced technology turbine prototypes and wind turbine blades, dynamometer testing of turbine drive trains, and hardware certification testing.

Technology Deployment—Responses to market barriers through activities such as interaction with Federal, State, and local regulatory processes, and projects that expand user experience with wind energy. The National Wind Coordinating Committee, a broad-based stakeholder collaborative, serves as a focal point for technology deployment activities.

Funding History



Laboratory-Academia-Industry Participation



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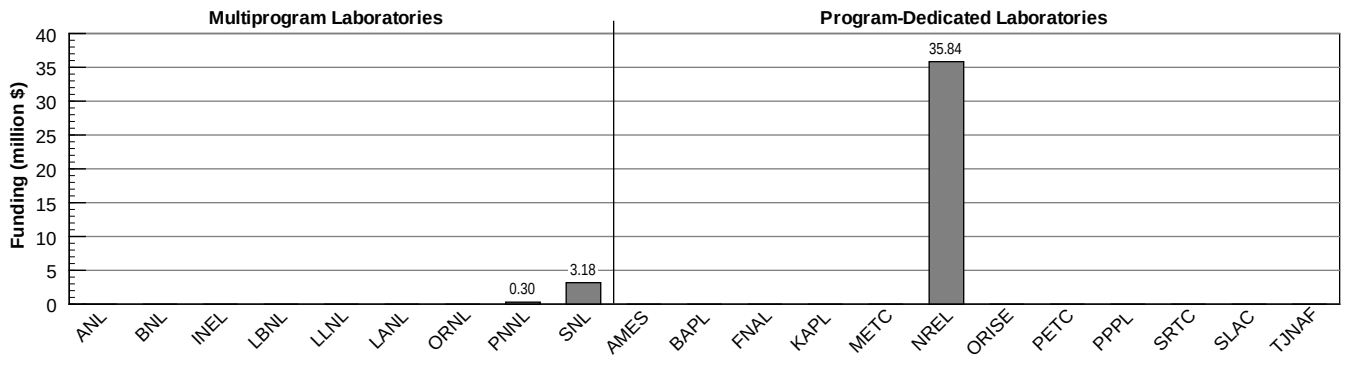


Solar International

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Technical and Financial Assistance
Element: Technical Assistance
B&R Code: EB27

Laboratory Complex

Principal Laboratories: NREL, SNL
Contributing Laboratories: None
Participating Laboratories: None

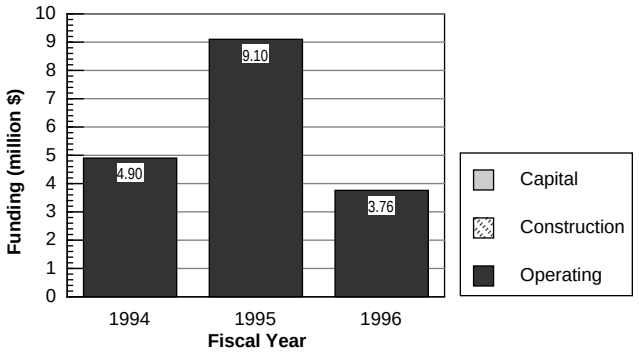
Mission Activity Description

The Solar International programs promote the export of U.S. renewable energy technologies worldwide. International market development is needed to strengthen support for U.S. renewable energy products and services in rapidly expanding global markets. Such efforts are required to gain maximum benefit from renewable energy markets that exist today, to counter the government efforts of foreign competitors, and to retain a preeminent role for the United States in the energy technologies of the future. Toward this end, the Solar International programs promote the reduction of trade barriers, the development of joint efforts with host country energy industries, the demonstration of the benefits of U.S. technology, and the collaborative resolution of rural electrification needs worldwide.

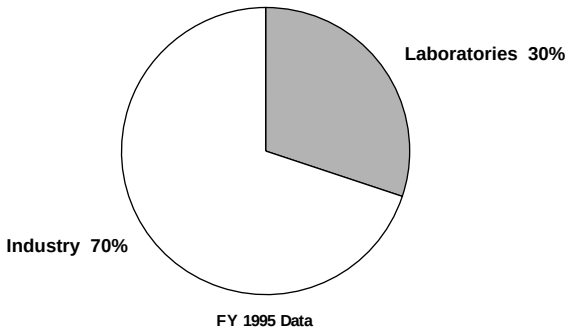
These programs play a critical role in helping U.S. manufacturers capitalize on the rapidly expanding international market for renewable energy technologies, which could reach $100 billion to $150 billion in the lesser developed countries alone. By increasing renewable energy exports, these programs create U.S. jobs, make U.S. businesses more competitive and reduce pollution from traditional energy sources.

One of these programs, CORECT (Committee on Renewable Energy Commerce and Trade) develops collaborative strategies in conjunction with the other 14 Federal agency members to best allocate limited Federal resources. Currently 175 promising renewable energy projects have been identified in Latin America which are being shepherded through the various stages of project development. Another program, the Americas 21st Century Program implements the CORECT strategies in Latin America and the Caribbean to deploy U.S technologies through cost-shared joint ventures with public and private sectors. The U.S. Initiative on Joint Implementation encourages public and private partnerships that use U.S. renewable energy technologies to reduce greenhouse gas emissions.

Funding History



Laboratory-Academia-Industry Participation



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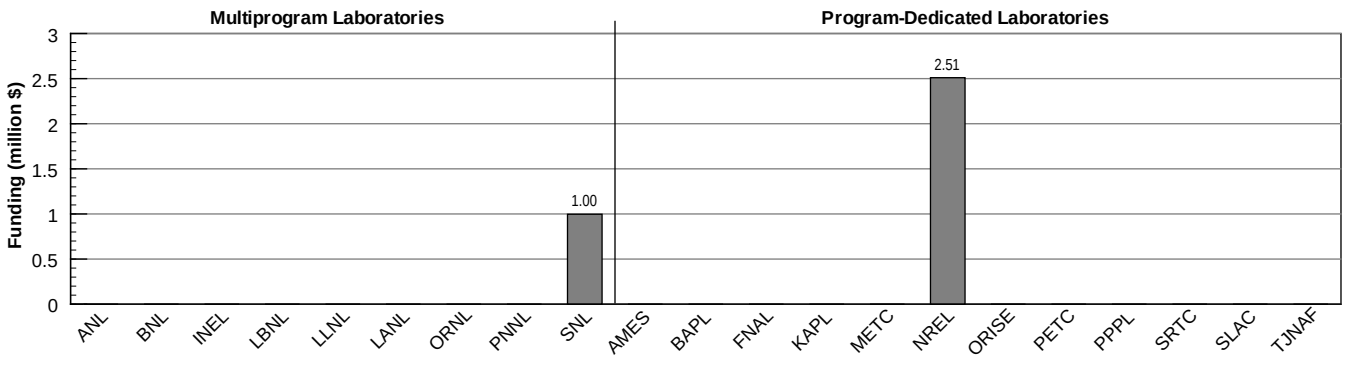


Solar Technology Transfer

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Technical and Financial Assistance
Element: Technical Assistance
B&R Code: EB28

Laboratory Complex

Principal Laboratories: NREL
Contributing Laboratories: None
Participating Laboratories: None

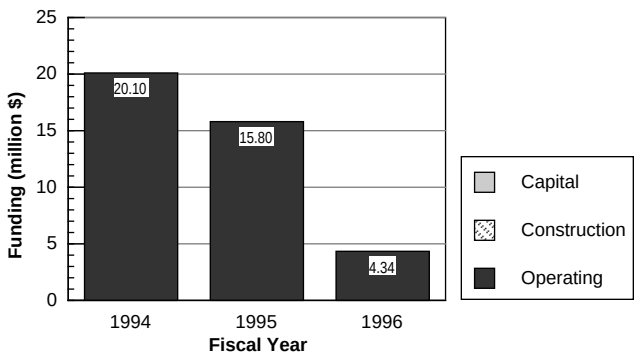
Mission Activity Description

The Solar Technology Transfer activity employs a two-pronged approach that addresses the specific problems that slow the acceptance of new and existing renewable energy technologies in the marketplace. First, is the lack of credible up-to-date information on the technologies and their various applications; and, second, is the need to "pull" rather than "push" emerging technological advances into the marketplace.

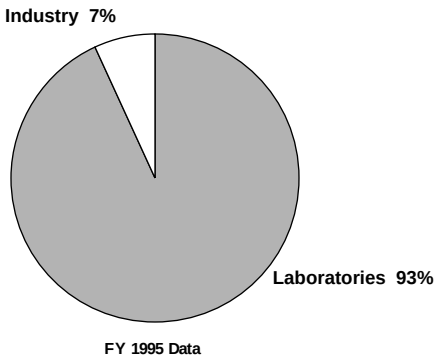
The Information and Communications subrogram reduces market barriers by directly educating consumers. This subprogram provides accurate and unbiased information on energy efficiency and renewable energy technologies so that potential customers make informed decisions in the marketplace that result in an increase in the adoption of renewable energy technologies and energy-efficiency practices. This Program also raises the overall awareness of the state-of-the-art technologies through the operation of both a toll-free telephone service and the more in-depth dissemination of brochures, exhibits, factsheets and tailored responses to specific energy questions.

The Commercialization Ventures subprogram facilitates the entrance of newly emerging technologies into the marketplace through the provision of financial and nonfinancial assistance. The Program leverages private sector financing and assists smaller emerging firms with the preparation of business plans. It supports the Department's commercialization objective, which is to accelerate the rate at which viable new renewable energy technologies and efficiency practices are drawn into the domestic and international markets.

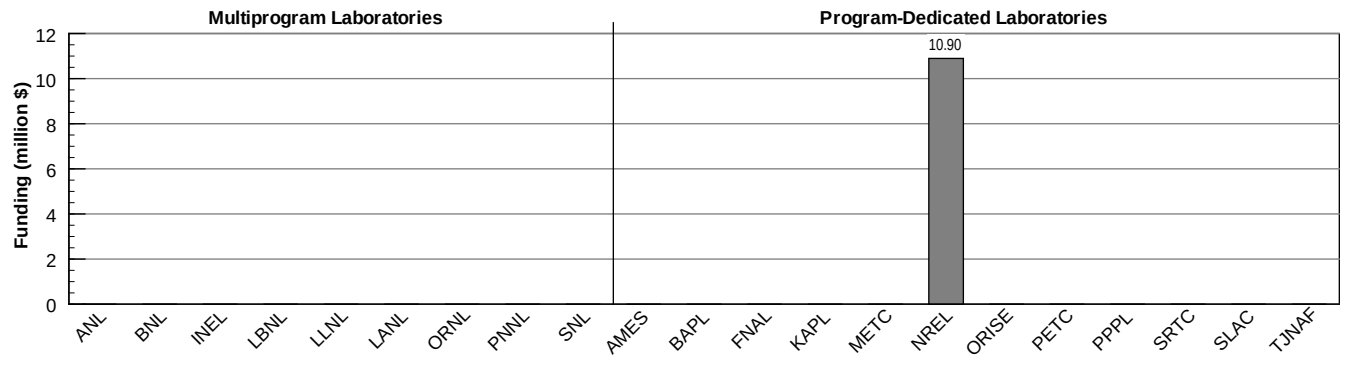
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Resource Assessment

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Solar Energy Conversion
B&R Code: EB35

Laboratory Complex

Principal Laboratories: NREL
Contributing Laboratories: None
Participating Laboratories: ORNL

Mission Activity Description

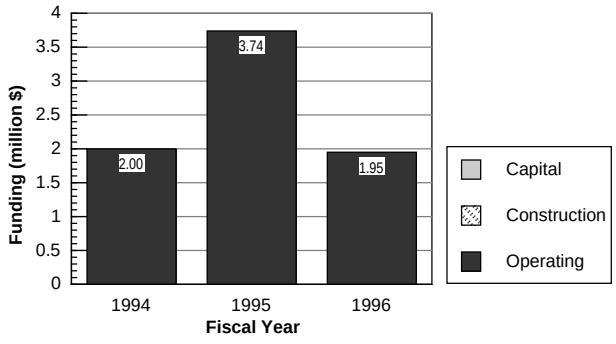
DOE's Resource Assessment activity supports the energy resources mission by developing databases, tools, and products about renewable energy resources (solar, wind, biomass, geothermal, and hydro) that allow planning, designing, and implementing renewable energy technologies. The overall long-term program goal is to improve information on the spatial extent and temporal characteristics of renewable resources, and to reduce the level of uncertainty in this information. This goal has been established because the quality of current resource information often is too limited to allow for adequate planning of the development and deployment of technologies. Because of the highly variable nature of renewable energy resources, uncertainties exist not only in our knowledge of the spatial extent of the resource, but also in how they might vary over the lifetime of a renewable energy system. These uncertainties still pose a significant barrier to the successful development of renewables.

Thus, in fulfilling the Resource Assessment Program's primary goal, several strategic approaches have been taken:

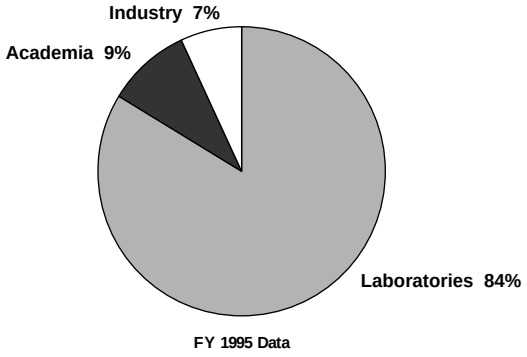
- The program develops hardware and software tools and analytical procedures that can be used by private industry and government planners to improve the assessment of renewable resources.
- The program supports long-term, continuous monitoring at strategic "benchmark" locations for wind and solar resources.
- The program provides a centralized location for assembling and disseminating national and international renewable energy resource information.

These actions benefit DOE in its long-term strategic planning by providing key information related to the potential market for various renewable technologies. This information also assists the U.S. renewable energy industry by removing critical barriers and speeding the successful deployment of its technologies, both domestically and internationally.

Funding History



Laboratory-Academia-Industry Participation



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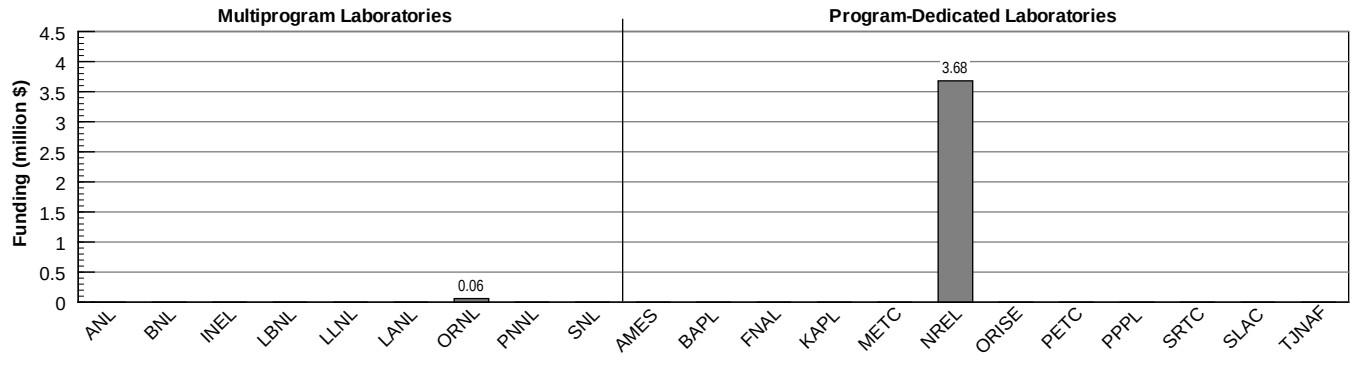


Technical and Financial Assistance

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Technical and Financial Assistance
Element: State and Local Technical Assistance
B&R Code: EF

Laboratory Complex

Principal Laboratories: NREL, ORNL, PNNL
Contributing Laboratories: None
Participating Laboratories: ANL

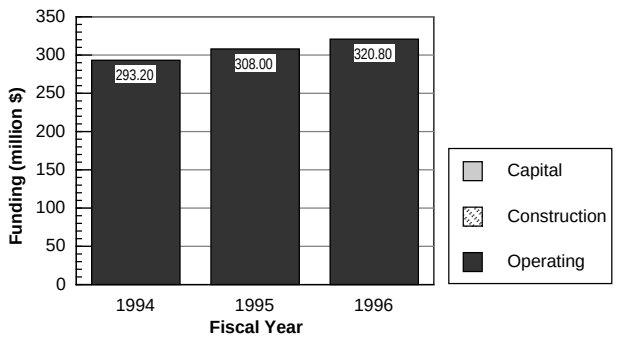
Mission Activity Description

The Office of Technical and Financial Assistance (OTFA) operates information, technical assistance, and financial incentive programs for States, local governments, nonprofit organizations, inventors, and individual consumers. These include grant programs and technical assistance that enable States and localities to deliver energy services to consumers in their jurisdictions and respond to energy emergencies; other programs assist in deployment of market-ready U.S. energy technologies, services, and products and help coordinate the wide array of Federal programs and activities involved in opening international markets to U.S. technologies. OTFA programs comprise two sets of key activities: State and Local Partnership Programs and Targeted Deployment Programs.

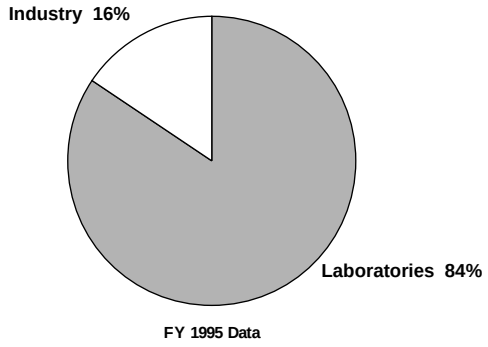
State and Local Partnership Programs—State and Local Partnership Programs key activities reflect the Nation's many diversities, address a broad spectrum of energy activities, and are characterized by a great deal of flexibility for States and local governments to identify and focus on their own needs and opportunities. These programs include the Weatherization Assistance Program, the State Energy Management Program, the Municipal Energy Management Program, and Program Direction.

Targeted Deployment Programs—Targeted Deployment Programs are more narrowly focused on specific markets, technologies, and/or stakeholders and potential users. Each program addresses a clearly defined market or clientele, a distinct market barrier, and/or a particular technology. These programs are made up of the Inventions and Innovation Program, International Market Development, the Information and Communications Program, and the programs funded from the Energy and Water accounts including Information and Communications, Commercialization Ventures, the Solar International Program, and the Regional Biomass Program.

Funding History

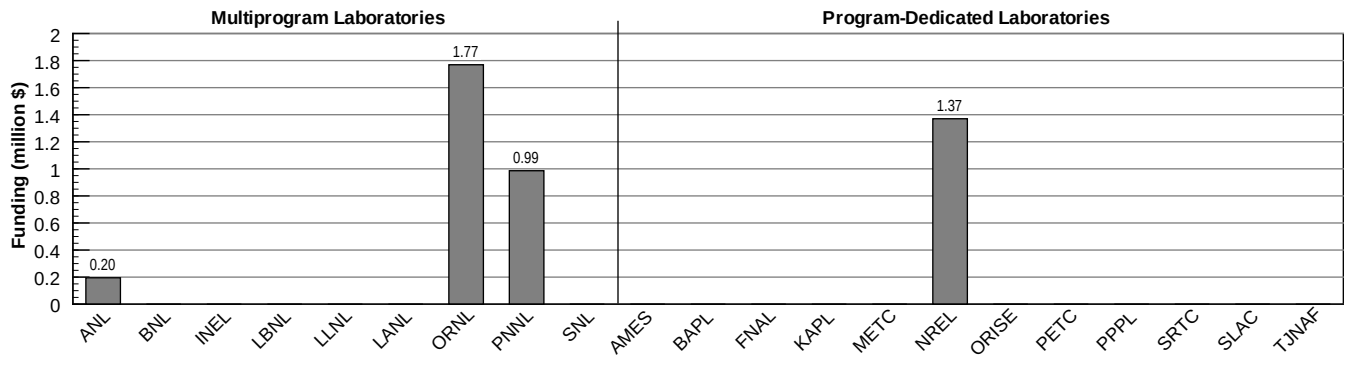


Laboratory-Academia-Industry Participation



Note: State and local partnership programs are not included here.

Fiscal Year 1995 Funding Profile



Geothermal Energy Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Renewable Energy Conversion
B&R Code: AM

Laboratory Complex

Principal Laboratories: LANL, SNL
Contributing Laboratories: None
Participating Laboratories: BNL, NREL, ORNL

Mission Activity Description

The Geothermal Energy Systems activity is a balanced program of research, technology development, and deployment aimed at reducing the life-cycle cost of electric power from geothermal resources and accelerating the direct use of geothermal heat, including heat pump technology. The program's overall goals are to reduce the operating cost of geothermal electric power facilities by 25 percent by the year 2000 and to reduce the life-cycle cost of new facilities by 30 percent by the year 2005. The five principal geothermal research and development areas are as follows:

Exploration Technology—Most known U.S. hydrothermal systems with obvious surface manifestations have been explored. Research in this area focuses on instruments and techniques to discover hidden hydrothermal systems and to explore the deep portions of known systems.

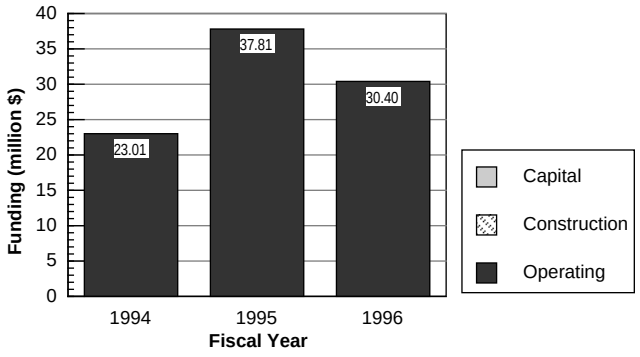
Drilling Technology—The drilling of wells accounts for 35 to 50 percent of the cost of generating electricity from geothermal resources. This technology development effort involves improved, less expensive drilling and completion equipment and methods for exploration and production.

Reservoir Technology—This research couples the development of advanced equipment and analytical methodologies with complex computer modeling to establish practical approaches for the identification, definition, and production of hydrothermal geothermal resources.

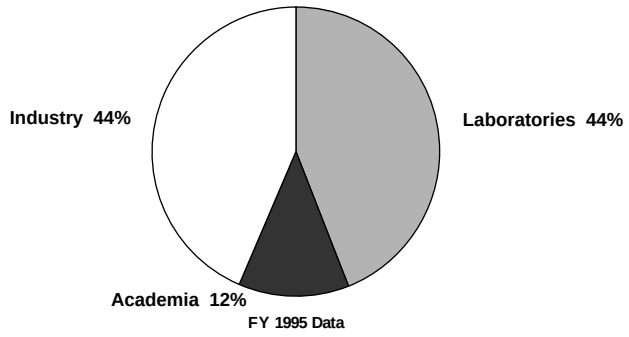
Conversion Technology—This research effort aims to reduce both capital and operating costs of systems that convert geothermal heat to electric power. Principal thrusts include innovative energy conversion concepts, improved cycle efficiency, advanced heat rejection systems, solid residue treatment processes, and low-cost materials resistant to elevated temperatures, corrosion, and scaling.

Environmental Technology—This category includes research, development, and deployment projects aimed at reducing greenhouse gas emissions. Geothermal heat pumps offer a unique opportunity for achieving significant reductions in such emissions.

Funding History

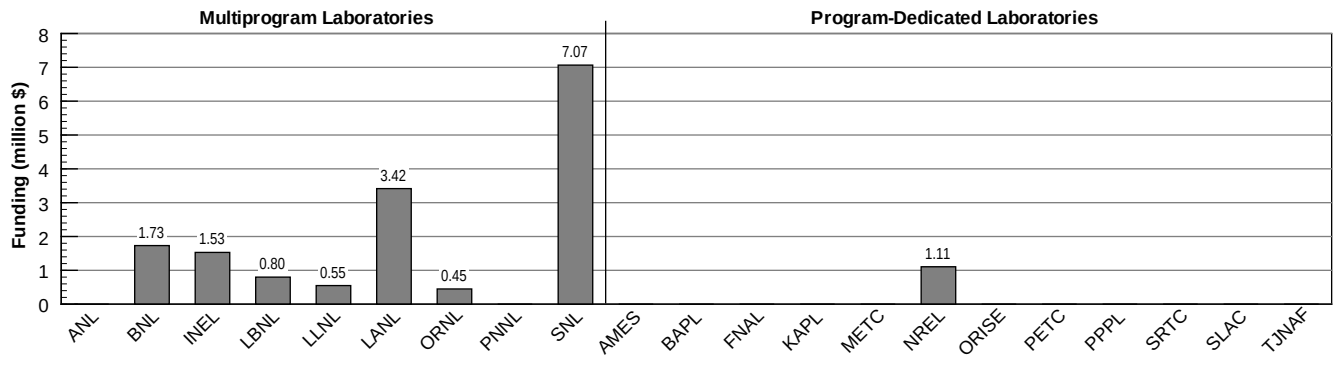


Laboratory-Academia-Industry Participation



Note: Includes ETEC in laboratory partition.

Fiscal Year 1995 Funding Profile



Hydropower

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Renewable Energy Conversion
B&R Code: CE10

Laboratory Complex

Principal Laboratories: INEL
Contributing Laboratories: None
Participating Laboratories: ORNL

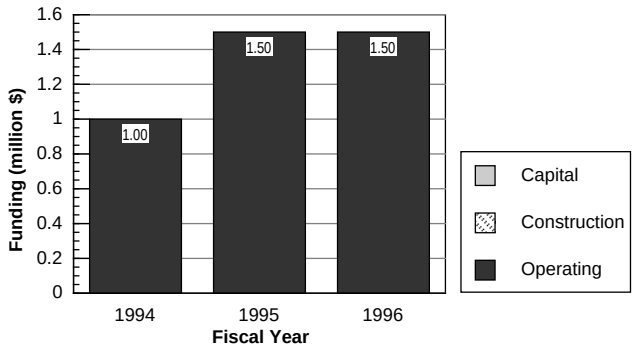
Mission Activity Description

The mission of the DOE Hydropower activity is to conduct research and development, in coordination with industry and other Federal agencies, aimed at improving the technical and environmental benefits of hydropower, thus supporting the DOE mission to achieve diversity in energy sources, a more productive economy, and improved environmental quality. Hydropower is the major renewable energy component in the United States, accounting for about 85 percent of electricity produced from all renewables. The DOE Hydropower activity is focused on the following areas:

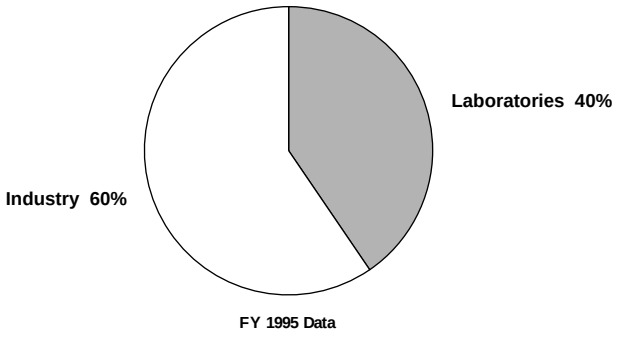
Advanced Turbine Development—In the advanced hydropower turbine systems area, cost-shared projects with industry are conducted to develop and test hydropower turbine technology aimed at balancing environmental, engineering, and cost considerations. The conceptual design phase of this effort is under way, with the award of two cost-shared contracts. The conceptual designs will develop and employ innovative technology intended to reduce injury and mortality to fish and improve water quality at the hydropower project. Planned future phases will proceed to engineering models and model testing, and finally full-scale prototype testing at an operating hydropower plant.

Resource Assessment—Resource assessment activities are conducted to enable the States to assess potential hydropower sites for development feasibility. DOE-developed uniform criteria, standardized methodology, and software enable a State to apply environmental and institutional attributes to a potential site and to determine the likelihood that the site can be developed. In addition, DOE is assisting the States in using these DOE-developed tools. Twenty State hydropower resource assessments have been completed.

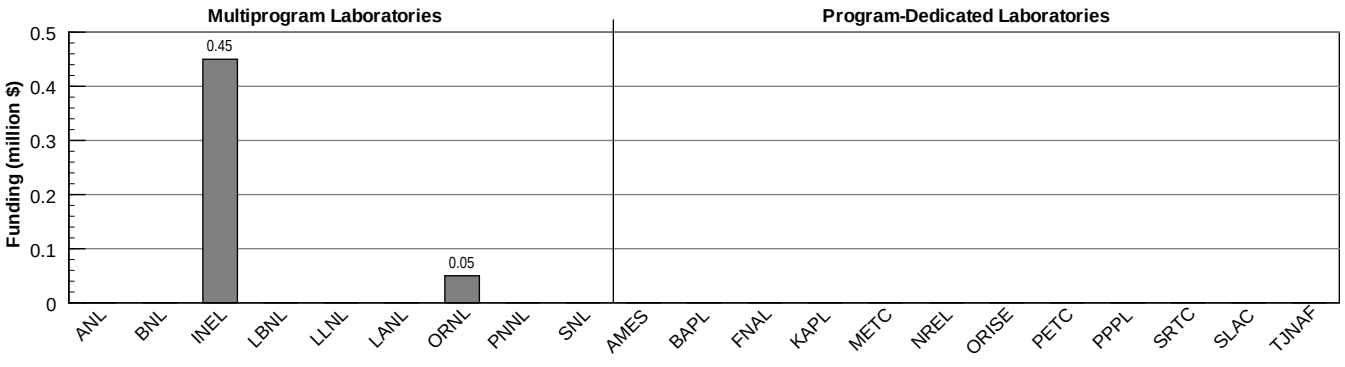
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Electric and Magnetic Field Effects Research

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Energy Management
B&R Code: AK04

Laboratory Complex

Principal Laboratories: ORNL, PNNL
Contributing Laboratories: None
Participating Laboratories: ANL, LBNL

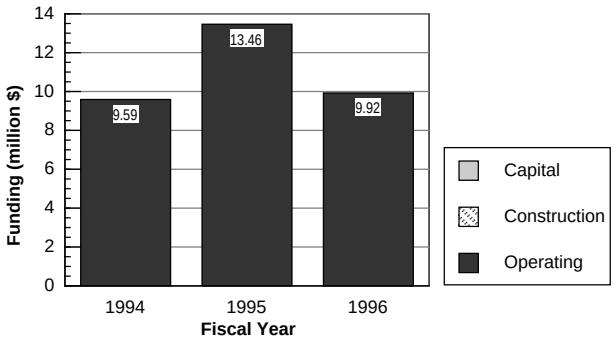
Mission Activity Description

To meet increasing needs for electric power, cost-effectiveness, reliability, and environmental safety must be assured. Public concern over potential health effects of electric and magnetic fields affects all these aspects in the generation, delivery, and use of electricity. The Electric and Magnetic Field Effects Research activity will reduce uncertainty and provide a scientific basis for dealing with the issue.

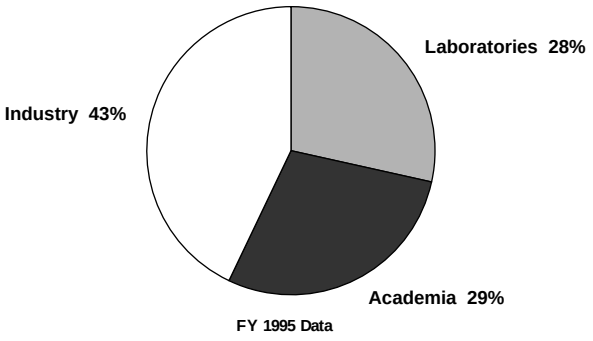
Electric and magnetic fields activities address the basic question of whether exposures to electric and magnetic fields from the generation, delivery, and use of electricity result in adverse human health effects. Since some epidemiological studies have suggested a relationship between field exposures and an increased incidence in certain cancers and other adverse health effects, there has been considerable public concern about this issue. The lack of definite answers to this question has resulted in increasing siting difficulties for new transmission and distribution facilities, which are needed for competitive electric markets and the widespread utilization of remote renewable energy resources, and in the redesign of certain types of electrical equipment and may be an impediment to the adoption of advanced electrotechnologies that are under development.

To address this question, most of the activities are in the areas of focused health effects research on biological pathways linked to the suggested health effects and exposure assessments. The purpose of the research and the exposure assessments is to provide needed information for a risk assessment by the National Institute of Environmental Health Sciences. Concurrently, a multiagency effort is also under way to provide the public and other decisionmakers with information on what we know about this issue and about activities that are being pursued to provide more definitive information.

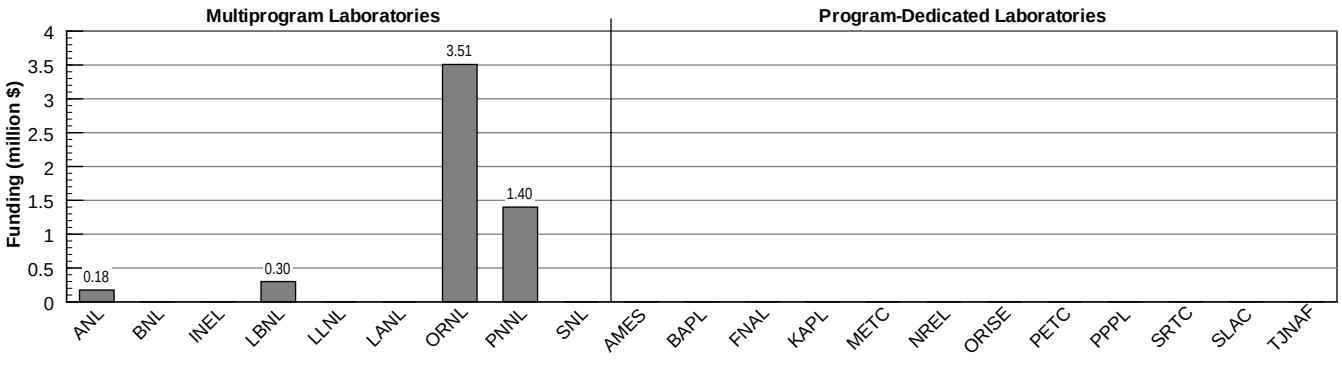
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Electricity Transmission and Distribution Reliability

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Energy Management
B&R Code: AK05

Laboratory Complex

Principal Laboratories: ORNL
Contributing Laboratories: None
Participating Laboratories: PNNL

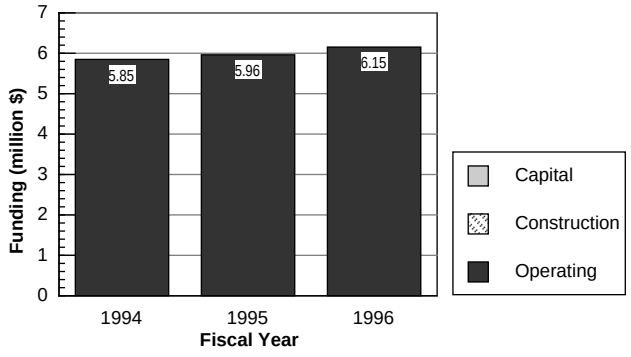
Mission Activity Description

The Transmission and Distribution activity develops and supports the adoption of advanced technologies that increase the flexibility, capacity, and efficiency of the U.S. electric delivery systems to enable more efficient electric markets. These system improvements are in two major areas: (1) the development of sophisticated information management, communication, and control system methodologies that allow real-time, automatic control of the electric power system and the full integration of energy supply, renewable energy, and energy-efficiency resources, and (2) the development of advanced, lower cost power-electronics technologies that increase overall transmission system capacity over existing transmission rights-of-way, reduce the cost of long-distance transmission, which will enable the development of remote renewable energy resources, and lower power-conditioning costs for renewable energy technologies, electric vehicles, and motor controllers.

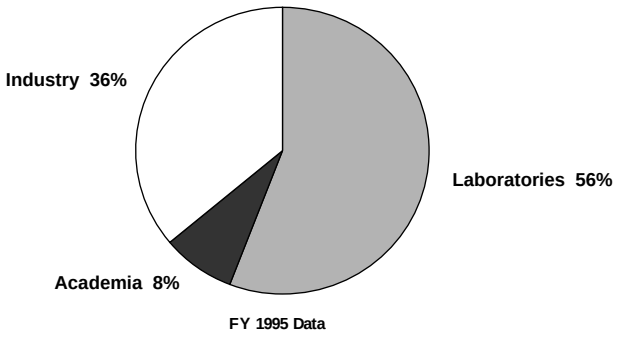
Real-Time Control and Systems Analysis—Real-time control and analysis activities apply advanced communications, computing, and control algorithms to allow operation of future power systems with lower capacity reserve margins, and enable full integration of renewable resources, energy storage, and end-use control technologies. Project activities include case studies with utility partners, and development of economic and technical modeling techniques to assess the impacts on electric power systems of increasing penetrations of renewable energy resources.

Advanced Power Electronics—The advanced power electronics element develops advanced system control and power electronics applications for power delivery and conversion systems to enable increased penetration of renewable energy resources, and more efficient use of existing power systems assets. Project activity is designed to develop low-cost, flexible power-conditioning equipment to interface renewable energy resources with the power system, and optimize a possible hybrid package that also includes storage and load control technologies.

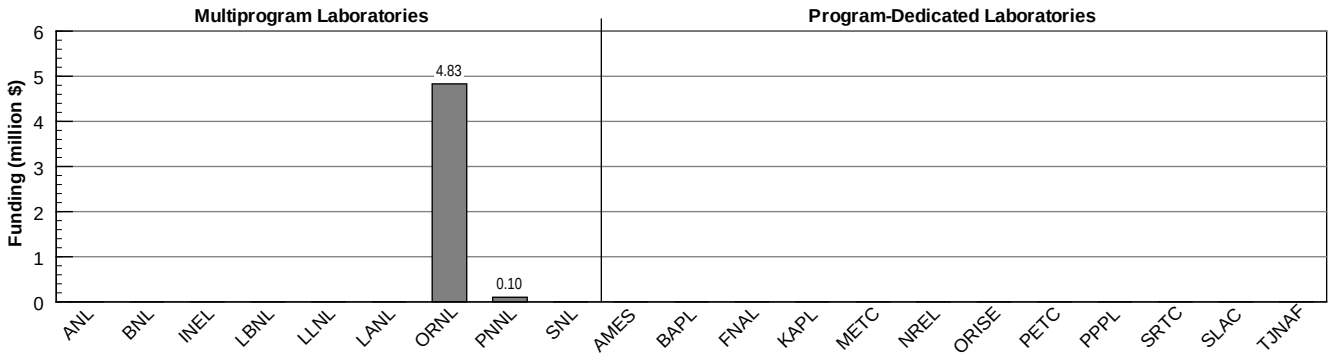
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Energy Storage Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Energy Management
B&R Code: AL05

Laboratory Complex

Principal Laboratories: SNL
Contributing Laboratories: None
Participating Laboratories: NREL, PNNL

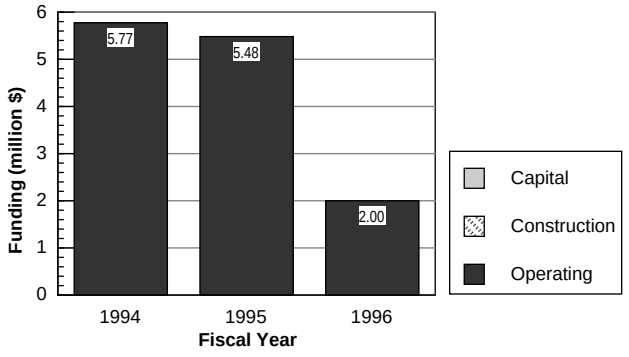
Mission Activity Description

The mission of the Energy Storage Systems (ESS) activity is to assist industry in developing cost-effective energy storage systems as a utility resource option for the year 2010 and beyond. The objectives of the ESS activity are to facilitate the increased use of renewable generation resources by 20 percent by 2010; increase the effectiveness and quality of electricity utilization and thereby improve the productivity per kilowatthour of U.S. industry by $7 billion through 2010; defer peaking capacity and transmission and distribution system upgrades, reducing needed investment by $32 billion; and reduce emission of carbon-dioxide from powerplants by 5 million metric tons through the year 2010. These objectives are completely consistent with the Energy Policy Act of 1992, the 1995 National Energy Policy Plan, and the Department of Energy Strategic Plan.

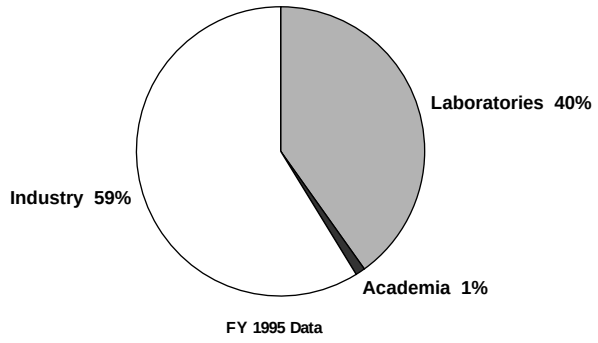
To accomplish its mission, the following research goals have been established: identify and evaluate the benefits of energy storage in utility applications; develop improved storage system components; develop cost-effective, modular, and multifunctional energy storage systems; characterize the performance of integrated systems with onsite field experiments; and increase industry awareness of the benefits of energy storage and options for providing it.

The activity includes development of a 2MW, 10-second power-quality energy storage system (field testing to be initiated in mid-FY 1996); development of an advanced battery system (ABS) using an integrated modular approach to reduce costs (the 0.5 MW 0.5 hr transportable prototype is expected to be ready for initial testing at a utility site in 1997); and development of an integrated renewable generation/storage (RGS) system for application with renewable power generators, a system estimated to increase the potential market penetration levels for renewables by 20 percent by 2010 (completion of prototype turnkey modular systems scheduled for 1999).

Funding History



Laboratory-Academia-Industry Participation



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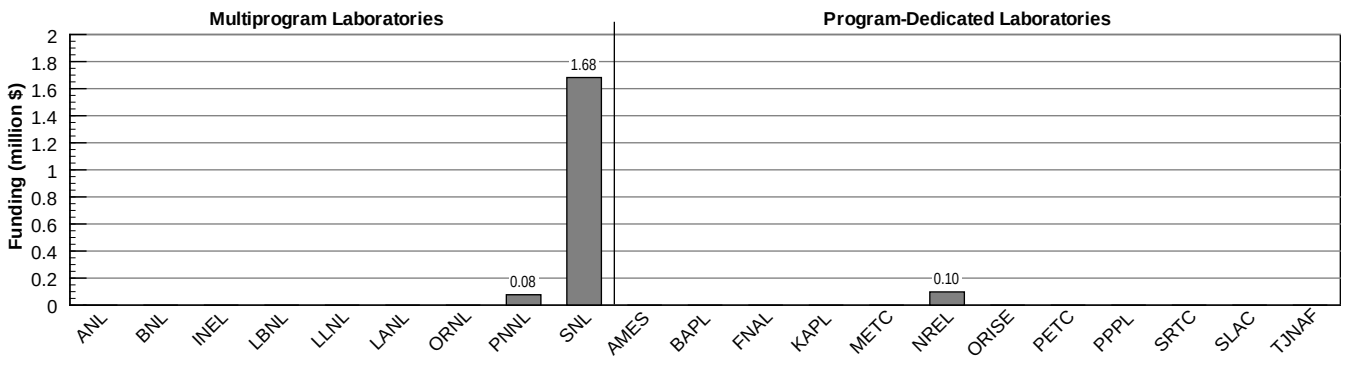


High-Temperature Superconductivity

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Energy Management
B&R Code: AK06

Laboratory Complex

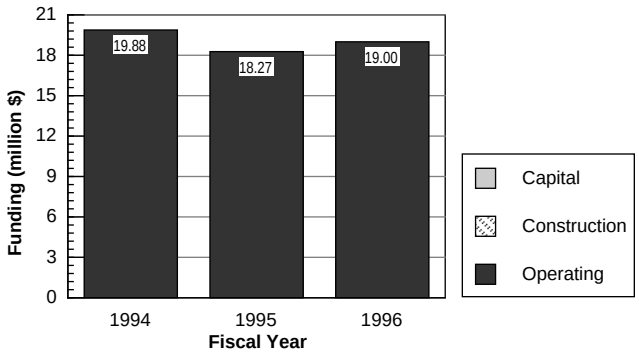
Principal Laboratories: ANL, LANL, ORNL
Contributing Laboratories: None
Participating Laboratories: BNL, NREL, SNL

Mission Activity Description

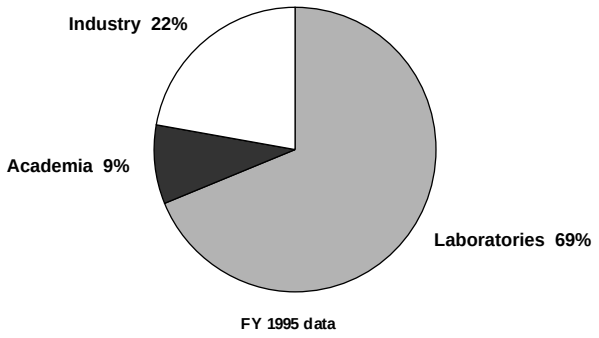
The superconductivity program mission is to develop the technology necessary for U.S. industry to proceed to commercial development of high-temperature superconductor electric applications. This program mission matches the Department mission of improving energy efficiency. The program has two distinct, but highly interdependent parts. The first part of the program provides funds to a DOE superconductivity complex made of expertise and facilities at six major laboratories. These laboratories are charged with using their unique capabilities to work in concert with private companies and universities to establish a U.S. manufacturing capability for high-temperature superconductivity based on research performed by interdisciplinary teams drawn from the labs, companies, and universities. These teams are formed through cooperative research and development agreements (CRADAs) between the labs and private companies, and by subcontracts between the labs and universities. The individual CRADA topics match program goals that advance the technology with company goals that meet their business interest. More than 30 CRADAs and 16 university contracts were active in 1995. The key technology is manufacture of high-temperature superconductivity wire.

In parallel with this effort, the second part of the program supports a strong application thrust, which, while proceeding separately, depends ultimately on the technology being successfully developed. This arm of the program is known as the Superconductivity Partnership Initiative and is carried out though four industry consortia that received awards following a 1993 competition. The industrial consortia are designing super-efficient motors, generators, current limiters, and electric transmission cables. The consortia are unusual in that each contains the full range of the research and development spectrum—the user (usually an electric utility), a manufacturer, and a superconducting component supplier. Industry has the key role in this part of the program. National laboratories are performing research tasks defined by the consortia using the laboratories' unique facilities and expertise. Each consortium project has specific technical and cost goals. These goals are also program goals.

Funding History



Laboratory-Academia-Industry Participation



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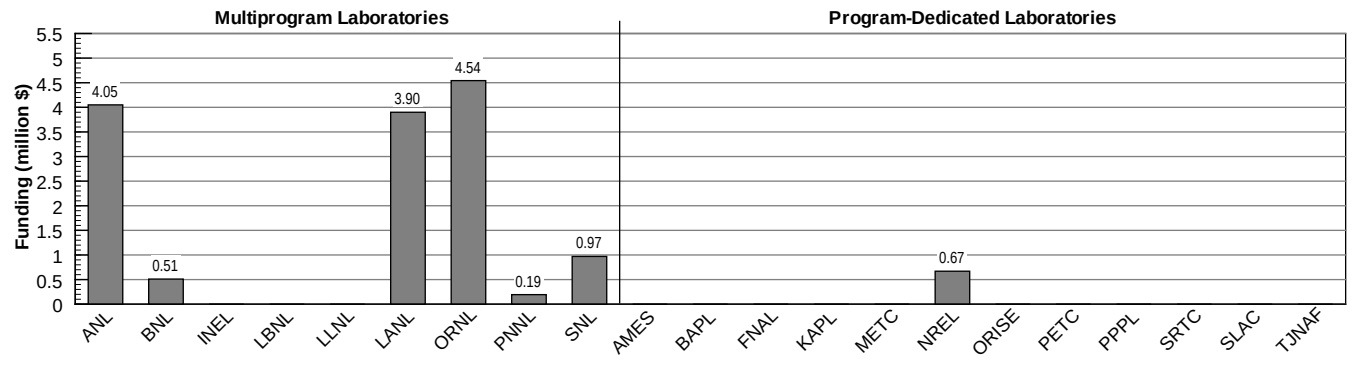


Hydrogen Research and Development

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Utility Technologies
Element: Energy Management
B&R Code: AR00

Laboratory Complex

Principal Laboratories: NREL, SNL
Contributing Laboratories: LLNL
Participating Laboratories: LANL, ORNL, PNNL

Mission Activity Description

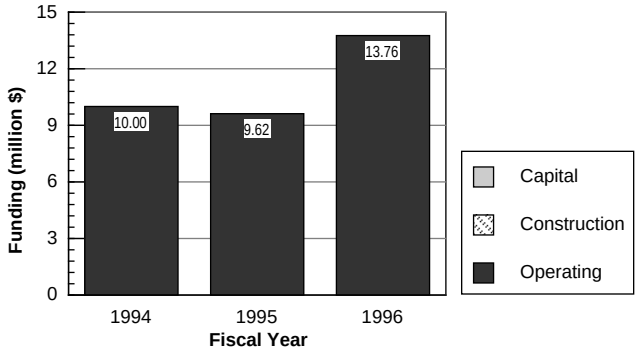
Hydrogen is an energy carrier with the potential to join electricity as a key component of a sustainable energy system. As an energy carrier and fuel, its future integration into the energy economy will help make renewable energy sources viable and practical. The three principal hydrogen research and development areas include:

Hydrogen Production—Hydrogen production technologies in use today are natural gas steam reforming and water electrolysis. Hydrogen is primarily used as a chemical feedstock, but has the potential to be a large-scale fuel produced from renewable resources such as solar energy and biomass. Representative hydrogen production projects include photoelectrochemical water-splitting with semiconductors, photobiology using photosynthetic microbes, biomass gasification and pyrolysis, and electrolysis using electricity from the grid or from renewable-based generation.

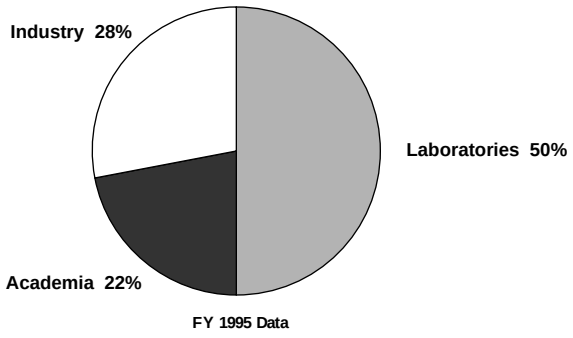
Hydrogen Transport and Storage—Hydrogen is an energy carrier that can be stored and transported in several physical forms depending on the intended application. Hydrogen can serve as a storage medium for electricity produced from intermittent renewables for stationary applications as well as onboard vehicle storage systems. Hydrogen storage and transport can serve similar roles and complement natural gas storage and pipeline systems being delivered to end-users. Hydrogen storage methods being investigated include pressure vessels, cryogenic dewar, metal hydrides, carbon adsorption, sponge iron, glassmicrospheres, novel materials, and underground caverns. Transportation methods include pipelines, trucks, railcars, barges, and tankers.

Hydrogen Utilization—Improved utilization technology will aid hydrogen's use as a transportation fuel and as an energy source and storage medium for industry and utilities. In the transportation sector, the leading technologies include the use of hydrogen in fuel cells and internal combustion engines. Pure hydrogen and hydrogen fuel blends are considered appropriate for internal combustion engines.

Funding History



Laboratory-Academia-Industry Participation



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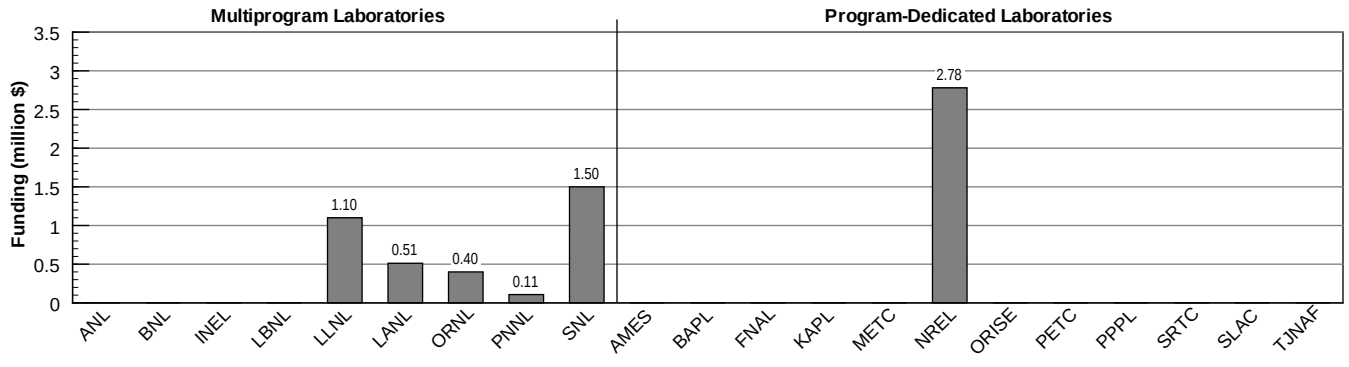


Building Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Building Technologies
Element: Building Energy Research
B&R Code: EC10

Laboratory Complex

Principal Laboratories: NREL, LBNL, ORNL
Contributing Laboratories: PNNL
Participating Laboratories: ANL

Mission Activity Description

The mission of the Building Systems activity is to improve dramatically the overall energy efficiency in commercial and residential buildings by improving the performance and integration of energy systems in buildings. The activity enables building owners and developers to capture cost-effective and significant energy-saving opportunities by combining research on optimal system designs with programs that deploy these energy-efficiency strategies in new building construction and existing building retrofits. Four subprograms contribute to the mission: residential buildings; commercial buildings; retrofit technologies; and best practices.

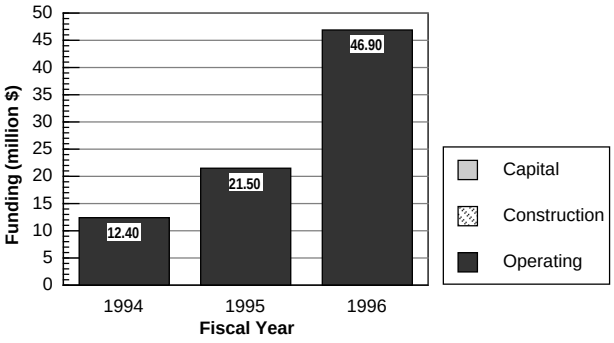
The *residential buildings* subprogram focuses on the application of systems engineering, factory production, and innovative building products to produce a new generation of housing that is 50 percent more energy efficient than today's construction, that is less costly to build, and that generates less waste during construction, operation, and ultimate disposal or recycling.

The *commercial buildings* subprogram aims to increase the adoption of energy-efficient control strategies and sound operation and maintenance practices within commercial and multifamily buildings. The main activity is the development of advanced controls and diagnostic tools for use in operation and maintenance performance analysis.

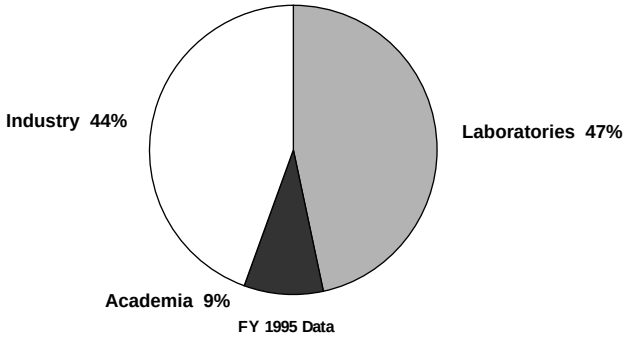
The *retrofit technology* subprogram seeks to increase the adoption of energy-efficient and renewable energy technologies into the Nation's stock of existing buildings.

The *best practices* subprogram is designed to make a collective contribution to defining "energy excellence" within the buildings sector by ensuring that cost-effective, energy-efficient, and renewable energy technologies and practices are given full consideration in the design of new buildings.

Funding History



Laboratory-Academia-Industry Participation



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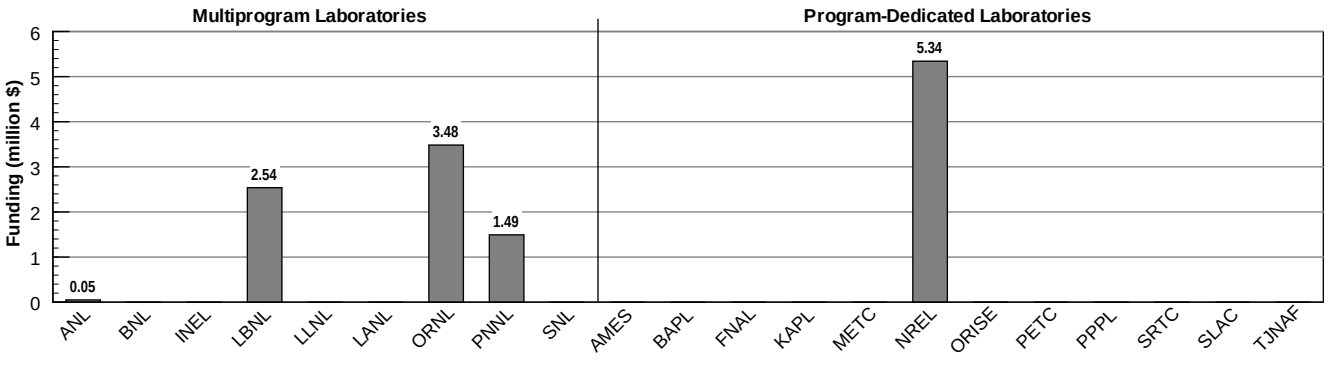


Building Envelopes

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Building Technologies
Element: Building Energy Research
B&R Code: EC12

Laboratory Complex

Principal Laboratories: LBNL, ORNL
Contributing Laboratories: None
Participating Laboratories: NREL, PNNL

Mission Activity Description

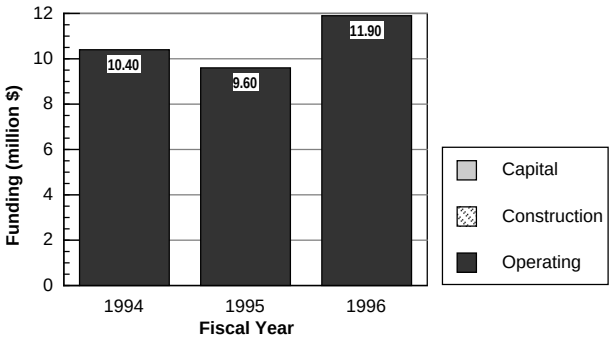
The mission of the Building Envelopes activity is to provide the technology options for the design of zero net heating and minimal cooling energy building envelopes by the year 2000 without adversely affecting the indoor environment. This will be achieved by maintaining a strong fundamental research base along with the support of key, highly leveraged, industry cost-shared programs. The program consists of a combination of research, manufacturing development, and testing in three areas: materials and structures; windows and glazing; and indoor air quality.

Materials and structures research focuses on the development of advanced insulation materials, and the application of advanced materials in building walls, roofs, and foundations.

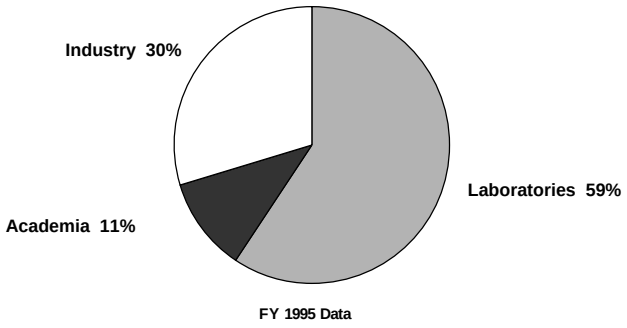
The windows and glazing activity is developing advanced technologies that will greatly improve the thermal and optical performance of windows, doors, and skylights, coupled with design, rating, and technical performance information that is needed to achieve accelerated market adoption of new fenestration technologies. Research currently focuses on electrochromic glazing with dynamically controllable optical properties and on advanced “spectrally selective” window coatings and films. Fenestration performance and simulation research is being carried out to establish a sound technical basis for performance rating and labeling of window products, and to provide upgraded design tools for use by manufacturers in improving the performance of their products.

Finally, indoor air-quality activities focus on research aimed at achieving a high level of indoor air quality without energy penalties.

Funding History



Laboratory-Academia-Industry Participation



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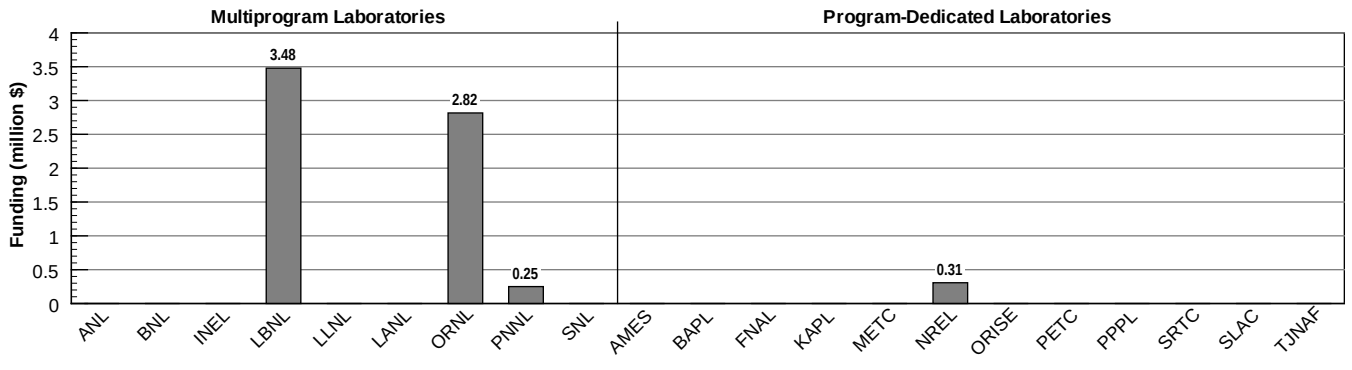


Building Equipment

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Building Technologies
Element: Building Energy Research
B&R Code: EC13

Laboratory Complex

Principal Laboratories: ORNL, PNNL
Contributing Laboratories: LBNL
Participating Laboratories: BNL, NREL

Mission Activity Description

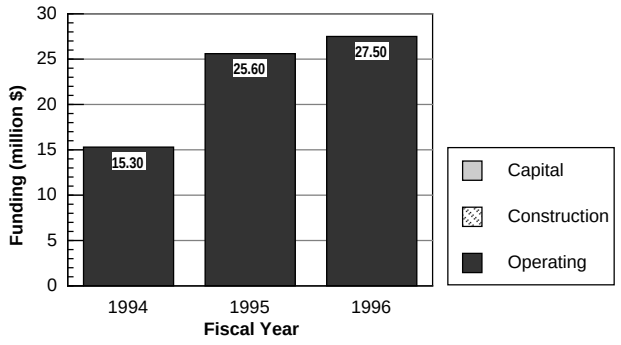
Building Equipment is a comprehensive research, development, and deployment activity conducted in cooperation with the private sector to provide industry with the advanced technology base needed for highly efficient, globally competitive building equipment and to accelerate its adoption and widespread utilization.

The Building Equipment activity has two primary thrusts: heating and cooling research and development (R&D) and lighting and appliances R&D. Heating and cooling efforts focus on development of high-efficiency natural gas and electrical heat pump and air-conditioning equipment, as well as development of oil combustion technologies. It addresses such technological challenges as development of non-CFC refrigerants, recapture (from the Japanese) of the technological lead in gas absorption technology, and development of critical data on exploratory technologies such as electrohydrodynamic heat exchangers, microelectromechanical systems, and novel refrigeration cycles.

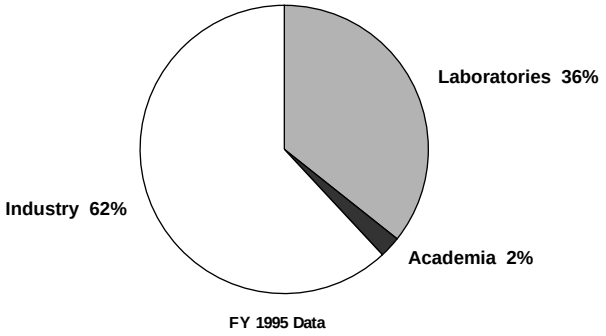
Lighting and appliances R&D focuses on development of advanced technology for providing lighting, hot water, refrigeration, office automation, and other services for buildings, and includes both evolutionary and revolutionary technology approaches to achieving this goal.

The Building Equipment activity conducts a Technology Introduction Partnerships (TIPS) activity to encourage and facilitate entry of high-efficiency building equipment technologies into the marketplace. TIPS employs significant interaction with manufacturers, utilities, retailers, and other stakeholders to overcome market-based barriers to technology deployment. It is an umbrella activity that considers all high-efficiency building equipment technologies that are ready for commercialization (not just those developed by the Department of Energy) that might otherwise be slow to penetrate the market.

Funding History



Laboratory-Academia-Industry Participation



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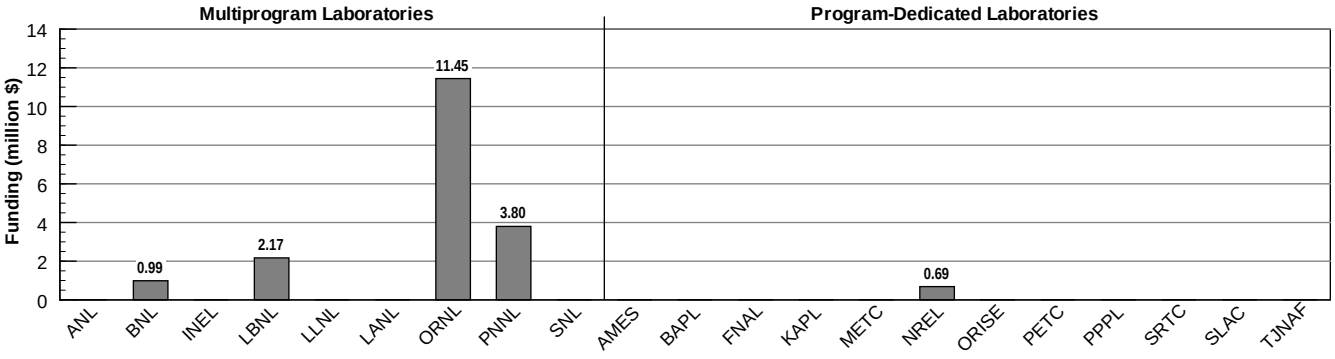


Codes and Standards

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Building Technologies
Element: Codes and Standards
B&R Code: EC14

Laboratory Complex

Principal Laboratories: PNNL, LBNL
Contributing Laboratories: NREL
Participating Laboratories: ORNL

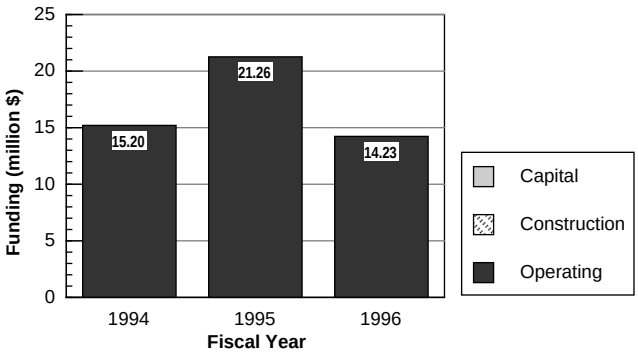
Mission Activity Description

The purpose of the Codes and Standards activity is to implement a legislatively mandated multiyear program to improve the efficiency of energy use in the Nation's buildings by establishing energy-efficiency standards, codes, and guidelines for buildings, building equipment, and appliances. Setting efficiency standards increases minimum efficiency levels and leads to substantial increases in the average energy performance of buildings and equipment. The activity is composed of two elements:

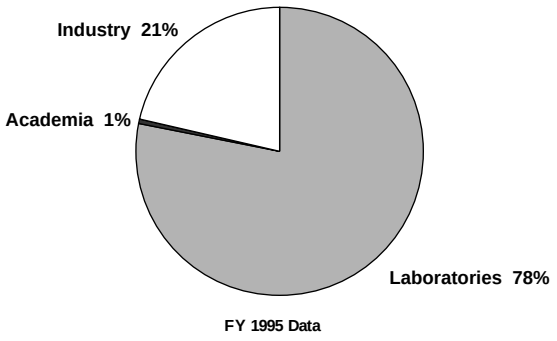
Lighting and Appliance Standards—This subprogram performs three functions: appliance and efficiency testing, labeling, and standards establishment. The Department of Energy prescribes test procedures that measure the energy efficiency and energy use and provide an estimate of the energy cost of each appliance; DOE and the Federal Trade Commission share responsibility for labeling. The Department also establishes and promulgates energy-efficiency standards designed to achieve the maximum improvement in energy efficiency that is technically feasible and economically justified. The Department actively encourages the participation and interaction of all interested parties at all stages of the rulemaking process.

Building Standards and Guidelines—The Building Standards and Guidelines subprogram strategy is to promote, assist, and act as a catalyst in developing and implementing building energy-efficiency codes, standards, and guidelines that are technically feasible, economically justified, and environmentally beneficial. By working in the market to eliminate the most inefficient technologies and building practices, this program complements the Department's efforts to develop and introduce advanced, highly efficient technologies. The program provides assistance to States to update and implement their building energy codes, assists building industry voluntary codes organizations to update their codes to include measures that are technically feasible and cost-effective, promulgates Federal building energy-efficiency standards, and assists with the development, testing, and deployment of energy-efficient financing mechanisms.

Funding History



Laboratory-Academia-Industry Participation



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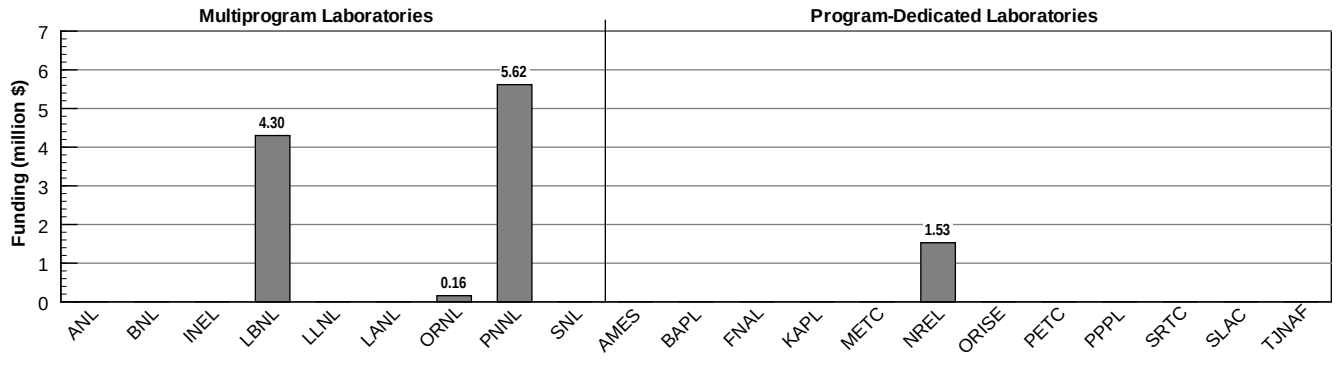


Federal Energy Management Program

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Federal Energy Management
Element: Federal Energy Management
B&R Code: EC26

Laboratory Complex

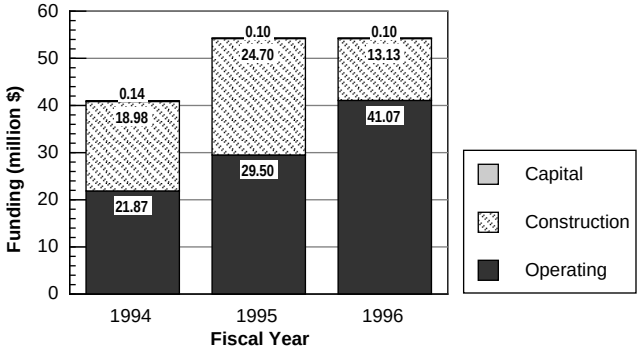
Principal Laboratories: NREL, LBNL, PNNL
Contributing Laboratories: None
Participating Laboratories: ANL, BNL, INEL, LANL, LLNL, ORNL, SNL

Mission Activity Description

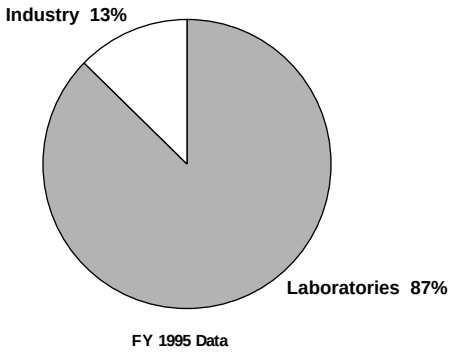
The Federal Energy Management Program (FEMP) carries out the DOE mission by example, leading and coordinating the Federal Government's energy-efficiency efforts. FEMP's outreach, technical assistance, and interagency coordination provide Federal leadership and customer-focused assistance necessary to achieve aggressive energy-efficiency goals. National laboratories provide key services in transferring to Federal energy managers critical design, operations, and financing information on innovative efficiency and renewable energy technologies. Special emphasis is placed on expanding the range and availability of energy project financing mechanisms, targeting private-sector funding through energy savings performance contracts and utility incentive programs, and including efficiency services in utility-areawide contracts.

The In-House Energy Management Program (IHEM) leads the Department of Energy's facility energy-efficiency efforts, as part of the overall Federal effort. IHEM, working directly with DOE and national laboratory facility staff, identifies retrofit projects and modifications that save energy or water and have a high return on investment. IHEM has historically provided funding from its budget for high-priority energy-savings projects at DOE Headquarters and field sites, including national laboratory facilities. Many projects leverage non-Federal resources, such as utility rebates and private-sector financing. Each dollar invested at DOE facilities for energy efficiency yields approximately $5 in net return. IHEM has reduced building energy consumption 24 percent since FY 1985, already achieving the FY 2000 goal, resulting in $100 million in annual avoided utility expenses. However, significant energy reductions can still be achieved at DOE sites, since it still has the highest energy consumption of all civilian Federal agencies. IHEM has been a part of the President's Investment Program for Federal Facility Energy Efficiency since fiscal year 1984.

Funding History



Laboratory-Academia-Industry Participation



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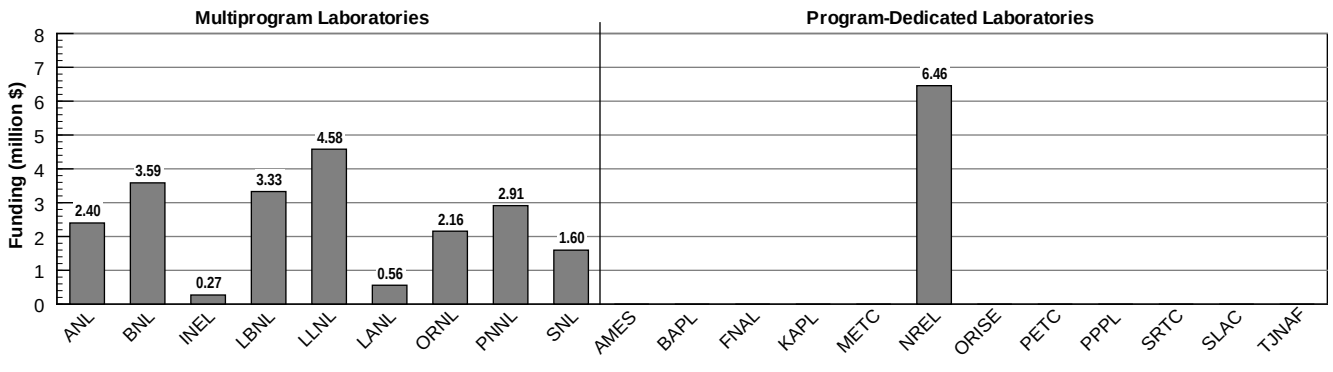


Building Technologies Implementation and Deployment

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Building Technologies
Element: Implementation and Deployment
B&R Code: EC27

Laboratory Complex

Principal Laboratories: LBNL
Contributing Laboratories: ORNL
Participating Laboratories: PNNL

Mission Activity Description

The mission of the Implementation and Deployment activity is to ensure that results generated by the Buildings Program reach the widest possible audience in the shortest possible time. Technical and scientific information must be customized to be understandable and useful to an array of building community stakeholders, including building and homeowners and tenants, lenders, builders and contractors, the real estate industry, State and local government agencies, industry (including trade associations), utilities, and others.

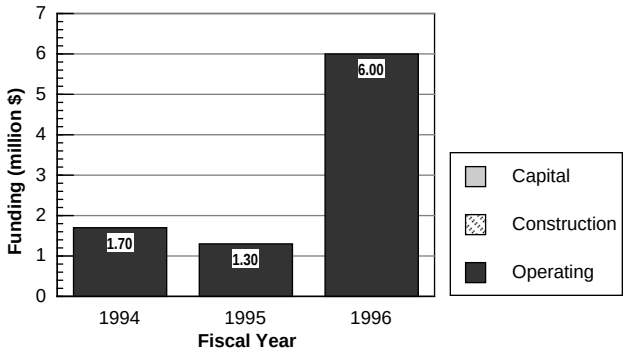
Complementing existing industry-government research partnerships, the Implementation and Deployment activity ensures an effective mix of technology-push and market-pull strategies. These strategies accelerate the use of DOE-developed and DOE-codeveloped technologies into the marketplace. Activities under this program include education and training, information outreach and technical support, and Cool Communities support.

Education and Training—Education and training activities use the existing infrastructure including trade associations (such as the Building Owners and Managers Association), the Federal Energy Management Program, and State energy offices to establish operation and maintenance training for commercial building operators.

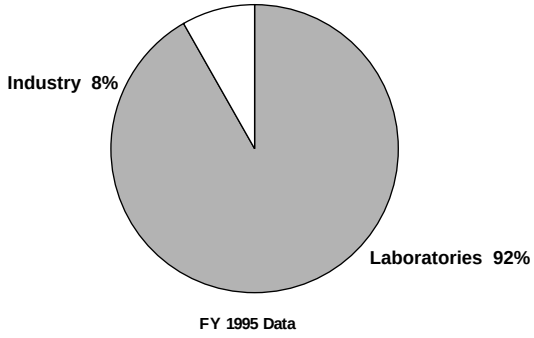
Information Outreach and Technical Support—Information outreach and technical support focuses on utilizing existing networks and developing other networks for disseminating information products.

Cool Communities Initiative—Given that urban areas create "heat islands" with summer temperatures from 2 to 4 degrees higher than surrounding areas, Cool Communities activities concentrate on quantifying this effect and verifying mitigation opportunities and savings.

Funding History



Laboratory-Academia-Industry Participation



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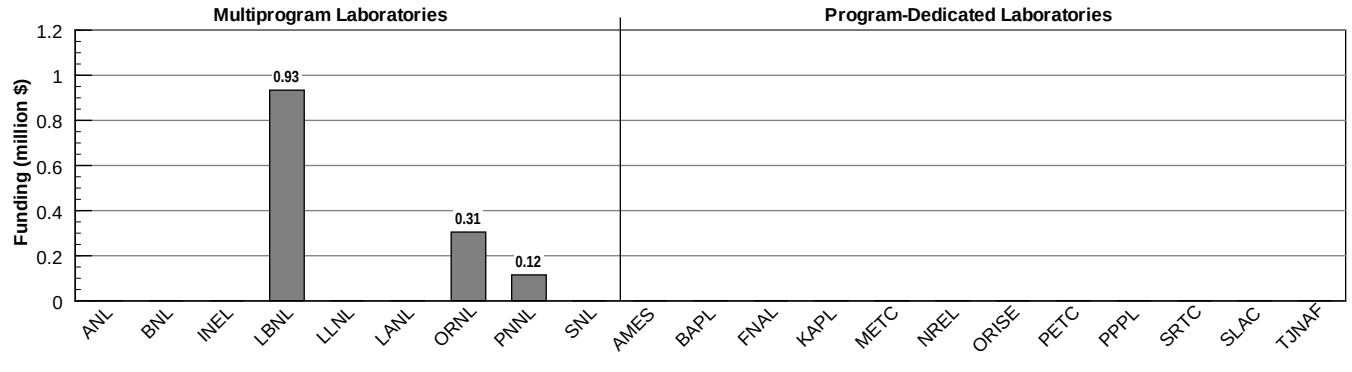


Cogeneration

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Industrial Processes
B&R Code: ED20

Laboratory Complex

Principal Laboratories: ORNL
Contributing Laboratories: None
Participating Laboratories: ANL, INEL, NREL, PNNL

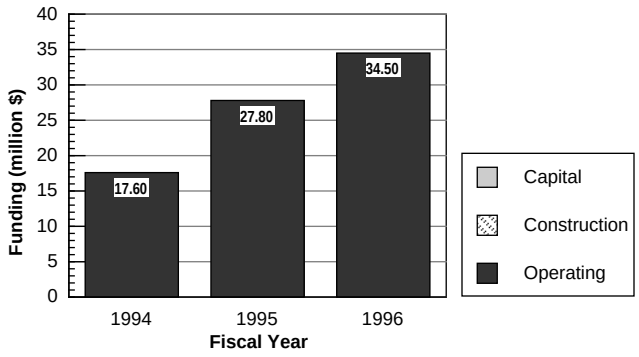
Mission Activity Description

Cogeneration technology enables U.S. industry to greatly improve the efficiency of power generation by using waste steam for productive industrial processes, particularly in energy-intensive industries such as chemicals, petroleum refining, and forest products. Cogeneration increases fuel efficiency to 60 to 80 percent—well above the typical electric utility efficiency of 35 percent. This increase in efficiency reduces industry's demand for fossil fuels used for power generation and the air emissions associated with combustion. The DOE cogeneration activity provides critical research needed for industry to develop new steam and gas turbine technologies expected to result in 21,000 megawatts of new cogeneration capacity (in addition to the expected 97,000 megawatt growth using conventional technology) by the year 2015. These new systems will greatly increase the energy productivity of U.S. businesses, reduce adverse environmental impacts associated with fossil fuel combustion, and reduce the vulnerability of manufacturers to energy supply disruptions.

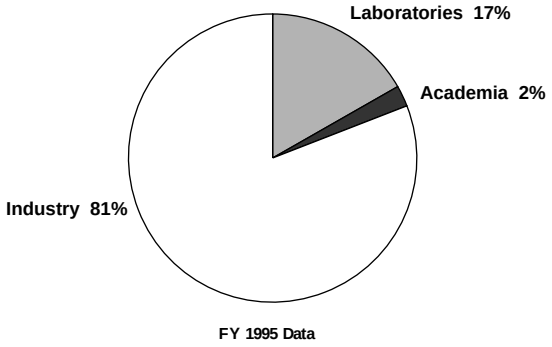
The work of the Continuous Fiber Ceramic Composite (CFCC) subprogram supports and strengthens the Advanced Turbine Systems Program by developing reinforced ceramic components that can withstand the increased turbine inlet temperatures necessary for enhanced turbine efficiency.

The Advanced Turbine System (ATS) subprogram, which focuses on gas turbine technology for both cogeneration and simple-cycle applications, represents the major component of the cogeneration activity. The Office of Industrial Technologies is developing an industrial-scale (up to 20-MW) advanced gas turbine that will have 15 percent higher efficiency than current gas turbines while achieving acceptable levels of reliability, availability, and maintainability. Initially the turbine is to be fueled with natural gas; in the future, low-grade fuels such as biomass and coal are expected to be used. The advanced gas turbine will also significantly reduce emissions of nitrogen oxides, carbon monoxide, and unburned hydrocarbons. Research and development is being conducted to develop selected ceramic components that will allow turbine firing temperatures approaching 2,600°F (compared with the current 2,350°F).

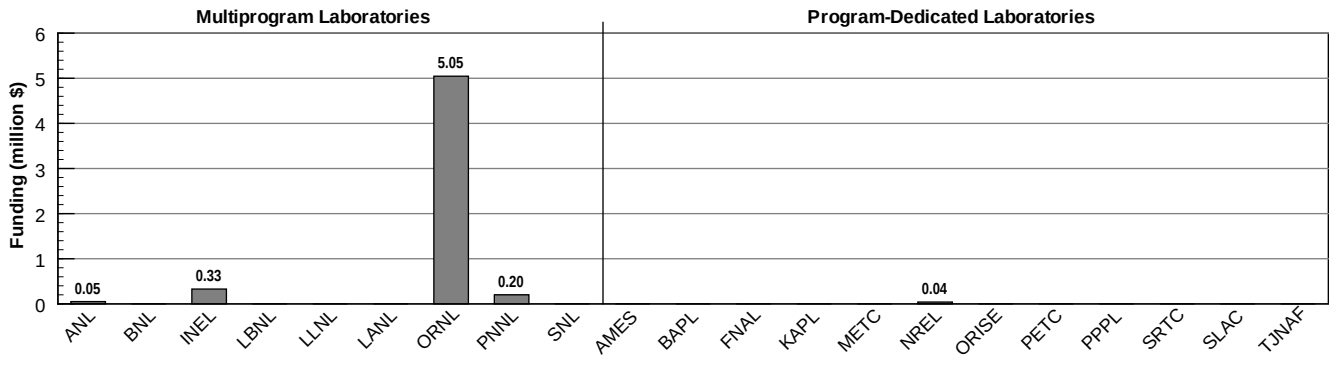
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Process Heating and Cooling

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Waste Reduction Technologies
B&R Code: ED21

Laboratory Complex

Principal Laboratory: ORNL, SNL
Contributing Laboratories: ANL
Participating Laboratories: INEL, LLNL, NREL

Mission Activity Description

The Process Heating and Cooling activity contributes to the Department's energy resources mission by improving the technologies of industrial process heating and cooling. These technologies—principally energy conversion equipment, heat transfer equipment, and heat pumps—are key to improved industrial productivity as well as higher energy efficiency. Advanced combustion technology, in particular, can also reduce environmental pollution and thereby eliminate the need for costly "add-on" pollution controls.

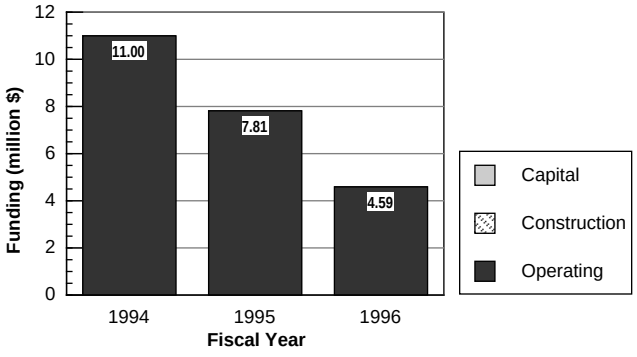
The Process Heating and Cooling activity sponsors research and development of heat exchangers, heat pumps, burners, and related equipment and controls to improve the efficiency of systems that provide direct or indirect process heat. Many of the systems being investigated recover and utilize waste heat produced onsite at industrial facilities such as steel mills, chemical manufacturing facilities, refineries, and pulp and paper mills. By recovering the energy embodied in waste fuels and waste heat, the new systems reduce primary energy use while increasing productivity through more efficient thermal processes. The process heating and cooling research and development projects are discussed below.

Heat exchanger research focuses on the recovery of high-quality waste heat that cannot be used with conventional technology because it is too corrosive or erosive.

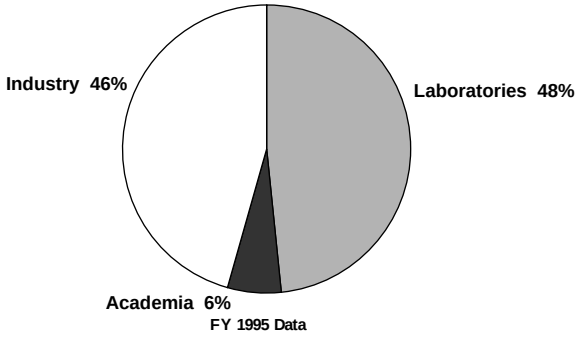
The heat pump program area continues to develop chemical heat pumps that will permit temperatures to be boosted 200 degrees Fahrenheit in a single step versus the 50 to 100 degrees Fahrenheit available from conventional heat pumps.

In support of the Energy Policy Act of 1992, the Office of Industrial Technologies is working with industry to develop high-efficiency combustion equipment that has low nitrogen oxide emissions, uses natural gas, and does not require "add-on" controls to meet the most stringent emission targets.

Funding History



Laboratory-Academia-Industry Participation



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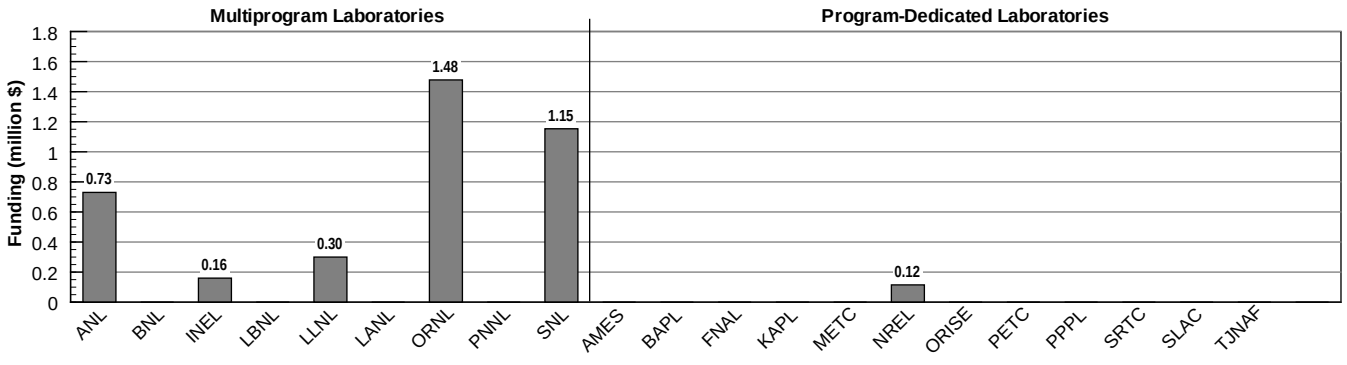


Materials and Metals Processing

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Industrial Processes
B&R Code: ED22

Laboratory Complex

Principal Laboratories: LANL, ORNL
Contributing Laboratories: None
Participating Laboratories: ANL, INEL, LBNL, NREL, PNNL, SNL

Mission Activity Description

The Materials and Metals Processing activity has four major subcategories: the Metals Initiative; process electrolysis; foundries and glass; and advanced industrial materials. The Metals and the Metal Casting Initiatives are mandated by Congress.

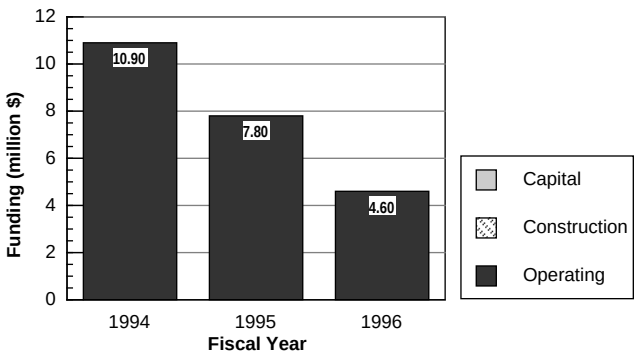
Metals Initiative projects are designed to provide cost-shared funding to support research and development (R&D) for the metals industries. These projects are designed to save energy, increase competitiveness, and improve the environment. Government laboratories act as subcontractors to industry. Industry selected the laboratories without DOE intervention using their own procurement practices, including competitive bidding. The laboratories are developing a number of sensors to continuously monitor the steel manufacturing process: (1) sensors to continuously monitor steelmaking furnace offgases and measure the molten steel temperature; (2) sensors to measure the iron-zinc phases in coated steels; (3) sensors to measure the temperature of coated steels as they are manufactured; (4) sensors to determine the physical properties of steel as it is rolled.

Process electrolysis work concentrates on nonferrous metals, including aluminum, magnesium, and copper. Work concentrates on improved technologies for energy efficiency and for new electrolytic methods. New concepts are transferred to the metals initiative for demonstration.

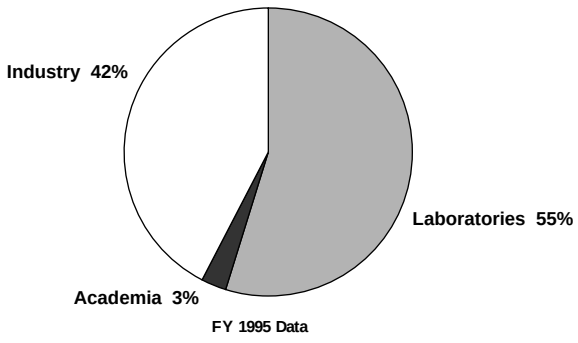
New metal casting technologies processes and alloy applications are being developed to reduce casting production time, improve casting quality and market application, increase foundry equipment lifetime, and minimize the environmental impact of the casting process. Environmental technologies are being targeted to achieve 100 percent pre- and post-consumer recycling, 75 percent beneficial reuse of foundry byproducts, and complete elimination of waste streams.

The glass industry strategy is designed to meet key technology needs identified by the industry in a long-term R&D vision. The industry has indicated advancement opportunities in the areas of production efficiency, energy and conservation, environmental protection, and innovative uses.

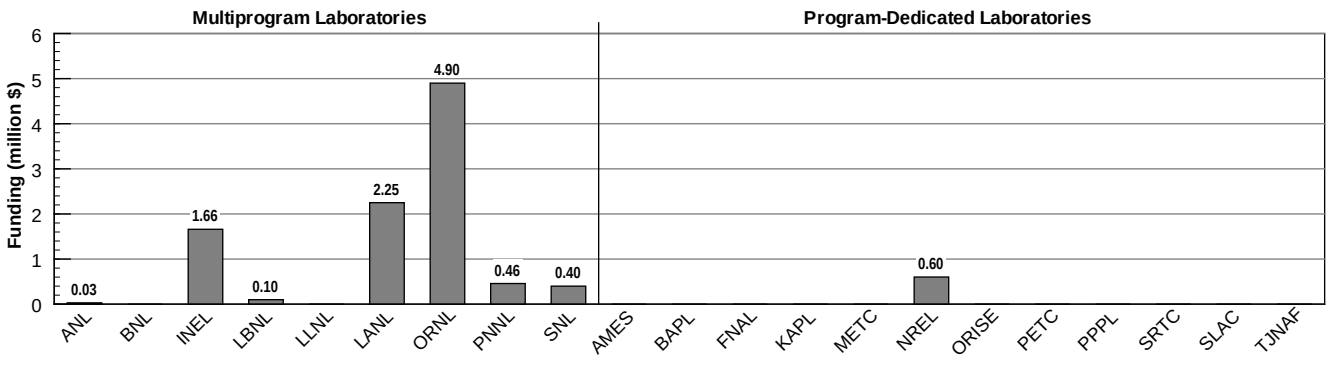
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Process Efficiency

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Waste Reduction Technologies
B&R Code: ED23

Laboratory Complex

Principal Laboratory: ORNL
Contributing Laboratories: ANL, NREL, PNNL
Participating Laboratories: Ames, INEL, LANL, LBNL, PETC, SNL

Mission Activity Description

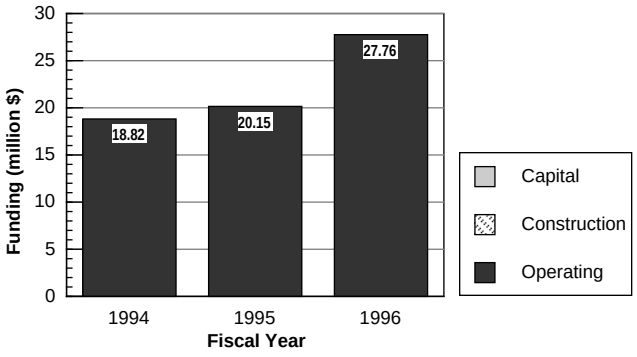
The Process Efficiency activity concentrates on improving efficiency in the energy-intensive process industries that provide the foundation for the U.S. manufacturing infrastructure, including chemicals, petroleum refining, pulp and paper, food, textiles, and agriculture. These industries are among the largest industrial energy consumers and generators of wastes. Development of leading edge process technologies in these industries is considered a key strategy for building and maintaining a strong industrial sector in today's highly competitive global marketplace. Specific research and development (R&D) activities include:

Chemicals and Petroleum Refining—R&D activities are conducted in support of the Office of Industrial Technologies' (OIT) Industries of the Future strategy, which interfaces with the chemicals and petroleum refining industries. Current process improvement efforts are directed toward increasing the efficiency of separation processes, including membrane technologies for energy-intensive gas and liquid separations. Catalytic membranes are also being explored as alternatives to conventional energy-intensive processes used in the production of high-volume chemicals.

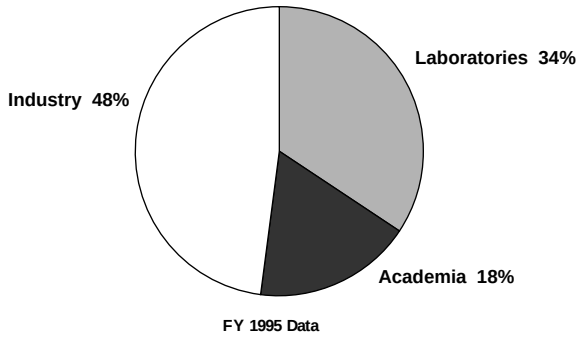
Pulp and Paper—In support of OIT's Forest Products of the Future program, R&D activities focus on the most energy-intensive process steps in the pulp and paper mill, such as chemical and mechanical pulping, chemical recovery, and papermaking. Technology highlights include a demonstration unit for a pulse combustion black liquor gasifier, and a new process to produce anthraquinone from lignin, a pulping catalyst.

Food, Textiles, and Agriculture—In food and agriculture, R&D is conducted on sensors and controls for drying processes, farm fertilizer use, and efficient irrigation practices.

Funding History



Laboratory-Academia-Industry Participation



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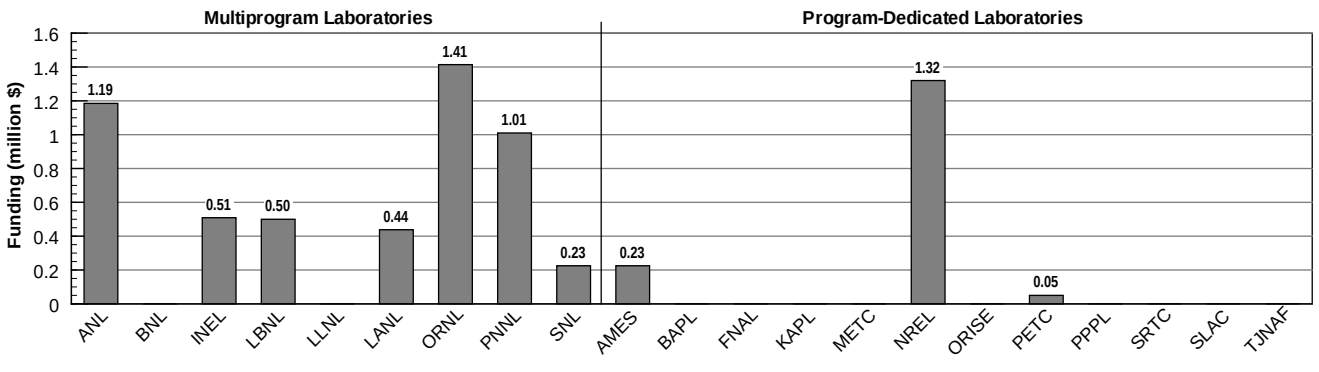


Industrial Waste

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Waste Reduction Technologies
B&R Code: ED30

Laboratory Complex

Principal Laboratories: ANL, NREL
Contributing Laboratories: LANL, PNNL
Participating Laboratories: INEL, ORNL

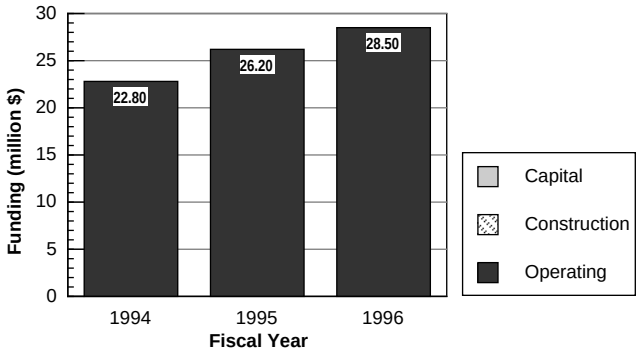
Mission Activity Description

The Industrial Waste activity seeks to improve the efficiency of industrial processes by reducing waste at the source and using wastes as productive feedstocks and fuels. U.S. industry generates roughly 14 billion tons of solid and gaseous wastes each year, with 60 percent generated from manufacturing operations. While estimates of energy associated with reduced wastes are speculative, at least 3 quads and as much as 9 quads of energy could be conserved by source reduction or by using industrial waste as a fuel.

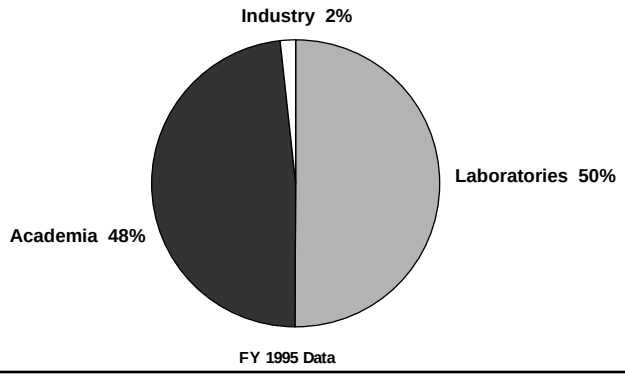
The Industrial Waste activity addresses the problem of industrial waste through research, development, and demonstration in waste reduction, utilization, and conversion. Research is conducted by national laboratories, universities, and industry in support of the energy-intensive process industries targeted under the Office of Industrial Technologies' (OIT) Industries of the Future program. Many pollution prevention opportunities are in these major process industries, such as chemicals, petroleum refining, and primary metals, which account for 80 percent of industrial wastes and 78 percent of energy use in manufacturing. The activity also funds projects in other industries such as automotive, aerospace, electronics, and industrial equipment where there is significant potential to make an industrywide impact on waste streams.

Waste reduction projects target process inefficiencies and seek to reduce waste at the source, before it is generated. Current research and development (R&D) include the following: microwave dissociation technology for in-process recycling of hydrogen sulfide waste; in-process recycling of electroplating waste; and pervaporation technology for the recovery and reuse of volatile organic compounds. Waste utilization and conversion projects are directed at using industrial and postconsumer waste streams productively when source reduction is not feasible or environmentally sound. R&D is currently focused on utilization of waste from scrapped automobiles, food processing waste, scrap plastics or polymers, textile mill scrap, paper waste, certain scrap metals, and wood waste.

Funding History



Laboratory-Academia-Industry Participation



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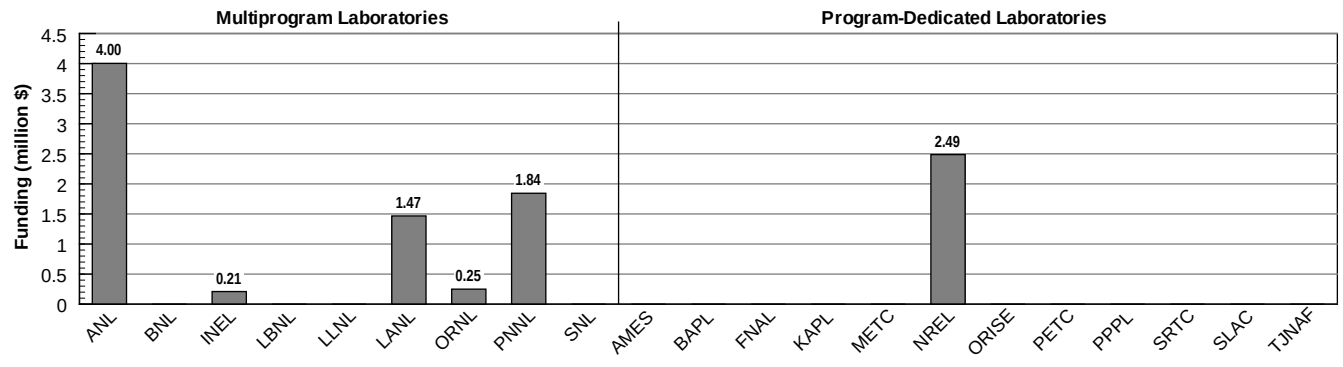


Municipal Solid Waste

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Waste Reduction Technologies
B&R Code: ED31

Laboratory Complex

Principal Laboratories: NREL
Contributing Laboratories: None
Participating Laboratories: None

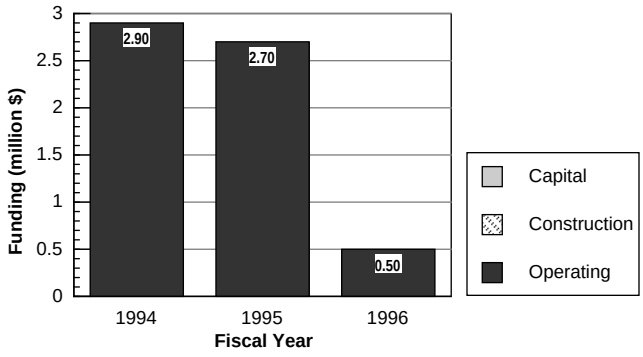
Mission Activity Description

Municipal solid wastes (MSW) present both an environmental threat to local communities and a largely untapped energy resource. Of the 250 million tons of solid wastes discarded to municipal waste facilities each year, less than 25 percent are used productively to generate electricity or used in new products after recycling. By using these wastes productively, the environmental impacts of municipal waste production on local communities will be greatly decreased and electricity can be generated without the use of additional fossil or nuclear resources. The estimated energy potential from productive use of MSW is 3 quads from power generation and 1.5 quads through material recycling. The MSW activity seeks to tap this potential by pursuing improved technologies for transforming waste to energy and by developing better information on waste recovery and recycling options. Accordingly, the MSW activity encompasses both applied R&D and data collection efforts:

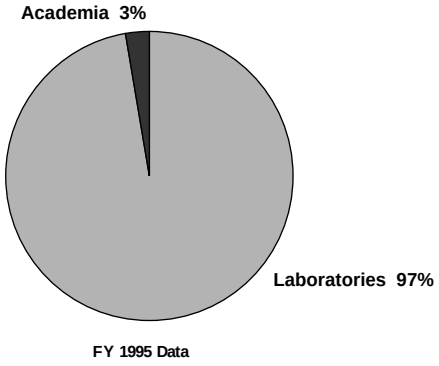
Applied Research and Development—Technology development has focused on co-combustion of sewage sludge, landfill gas utilization, and improved environmental controls for waste-to-energy plants (for example, reburn and lime injection to reduce acid gas emissions, and direct injection of chemicals to meet chlorine and sulfur emission levels).

Data Collection—Factual life-cycle data on waste-to-energy plants and recycling are collected to help decisionmakers and the public make informed decisions on various MSW disposal and utilization options.

Funding History



Laboratory-Academia-Industry Participation



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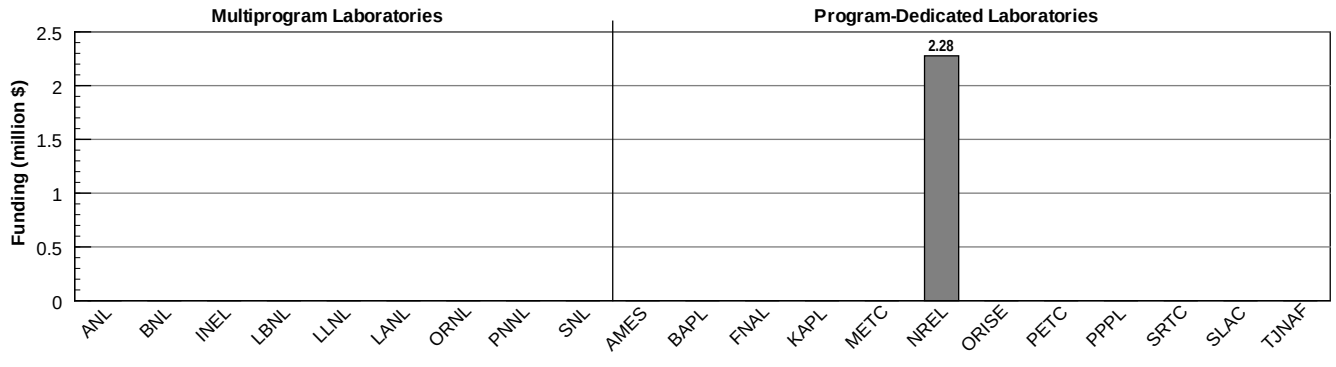


Electric Motor Systems

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Industrial Processes
B&R Code: ED33

Laboratory Complex

Principal Laboratory: ORNL, NREL
Contributing Laboratories: None
Participating Laboratories: LBNL, PNNL

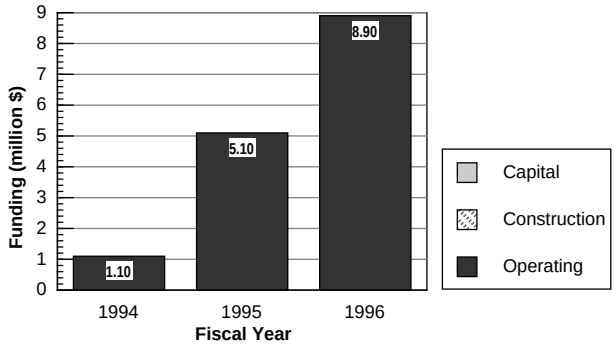
Mission Activity Description

Incremental improvements in the efficiency of motors, motor drive systems, and associated control technology can, when the best technology is implemented, have broad-based impacts across many industries in reducing electricity use and reducing production costs for U.S. industry. The Electric Motor Systems (EMS) activity serves the energy resources mission by providing technical and cost information to assist industry decisionmakers in electric motor system buying decisions. Purchasing decisions made today will affect the productivity and efficiency of industry for many years.

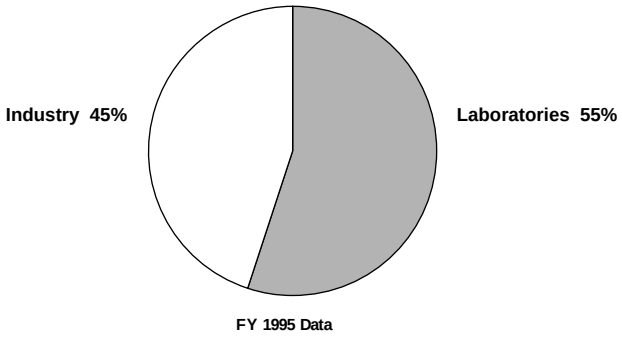
Motor Challenge, the centerpiece of the EMS activity, is a joint effort of DOE, industry, equipment manufacturers and distributors, and other interested parties to promote integrated systems of energy-efficient motors, adjustable speed drives, and energy-efficient motor-driven mechanical equipment and processes. Motor Challenge is recognized as representing a significant opportunity to enhance environmental performance and reduce energy consumption in U.S. industry.

The overall goal of the Motor Challenge initiative is to advance industry leadership and provide technical assistance and resources to industry so that firms will better understand, apply, and target energy-efficient EMS from a systems perspective. Motor Challenge consists of six program elements: (1) a Trade Ally program where suppliers, distributors, and utilities commit to work with Motor Challenge to assist the trade allies' clients to capture the benefits of energy-efficient motor systems; (2) an Excellence Partner program where industrial end-users commit to developing and implementing a plan to continually improve motor system management practices; (3) Showcase Demonstrations that involve industrial end-users leading teams that demonstrate and validate the costs and benefits of electric motor-driven system performance in varied settings and applications; (4) an information clearinghouse that disseminates reliable and timely information to thousands of industrial stakeholders; (5) market transformation initiatives that aim to encourage the market to offer new types of information, products, and services that will help end-users specify and capture energy-efficient motor systems more broadly and cost-effectively; and (6) market assessment and program evaluation activities that assist in understanding and characterizing the industrial motor systems market.

Funding History



Laboratory-Academia-Industry Participation



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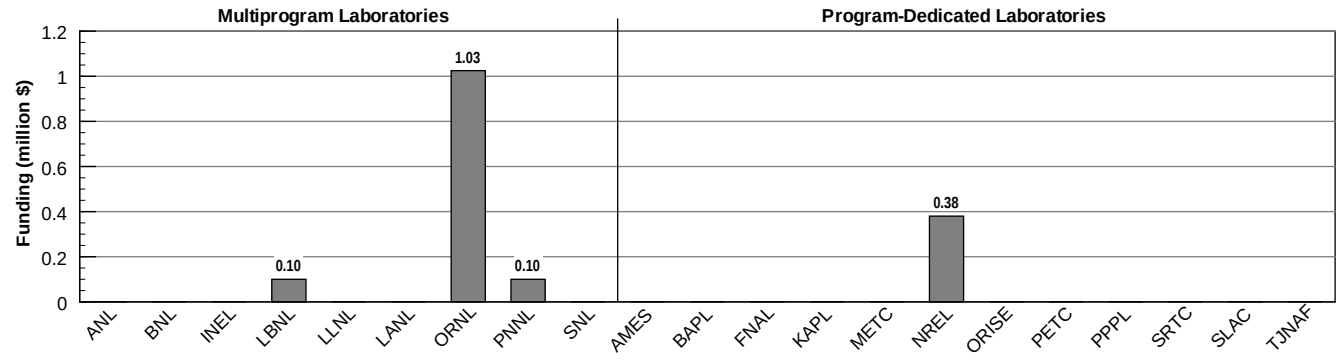


Industrial Technologies Implementation and Deployment

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Industrial Technologies
Element: Waste Reduction Technologies
B&R Code: ED41

Laboratory Complex

Principal Laboratories: NREL
Contributing Laboratories: ANL, ORNL, PNNL
Participating Laboratories: INEL, LANL, ORISE, SNL

Mission Activity Description

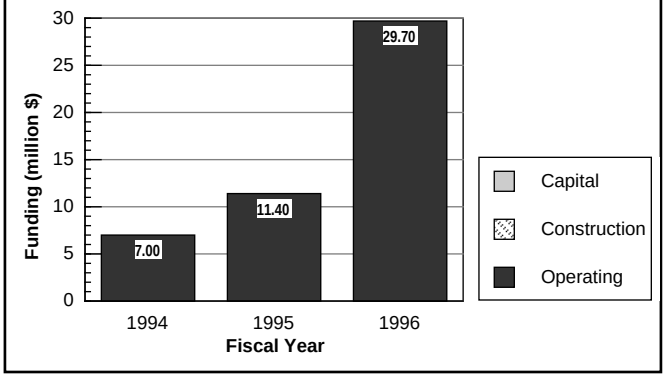
The mission of the Industrial Technologies Implementation and Deployment activity is to work with industry to create partnerships and channels for deploying energy-efficient technologies. The focus of these efforts are on the deployment of energy-efficient and waste-minimizing technologies for the most energy-intensive process industries. By improving the access to advanced energy-efficient technology, DOE can help U.S. industry to improve its energy productivity, increase its economic competitiveness, and improve its environmental performance. Technology Access currently consists of five elements: technology transfer and four partnership programs including Climate Wise, NICE^3, Motor Challenge, and the Industrial Assessment Center (IAC) Program.

Technology Transfer—Cooperative programs are conducted with Power Marketing Administrations, utilities, industry, and trade associations to facilitate the successful transfer of assistance and information to industrial end-users of technology.

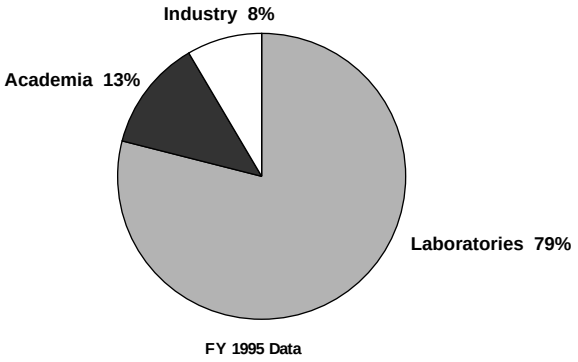
Climate Wise—Climate Wise is a voluntary program encouraging U.S. industry to take advantage of cost-effective energy-efficiency and pollution-prevention activities leading to greenhouse gas emissions reductions.

Industrial Assessment Center Program—The IAC Program, formerly the Energy Analysis and Diagnostic Center (EADC) Program, provides small and medium-sized manufacturing plants with no-cost industrial assessments that include energy audits and waste minimization assessments enabling facilities to become more energy efficient and to reduce energy costs.

Funding History

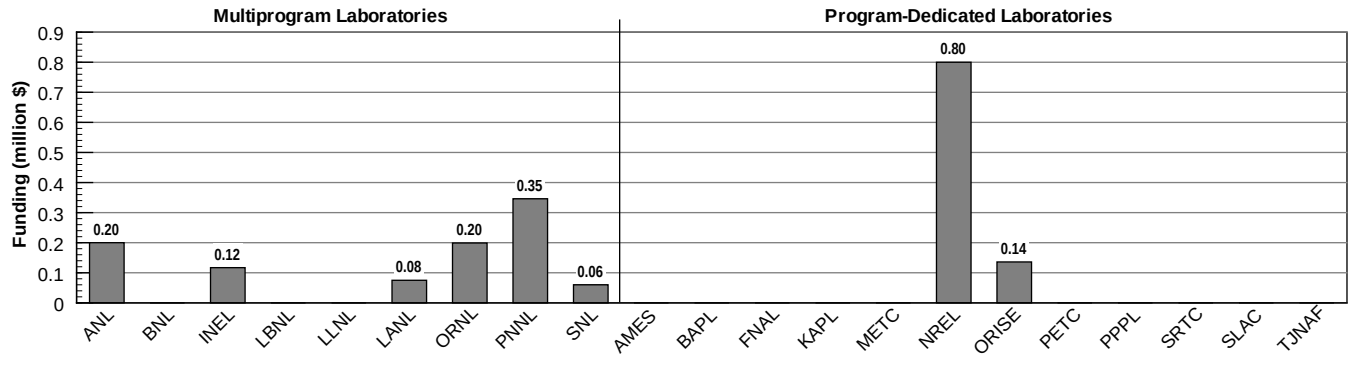


Laboratory-Academia-Industry Participation



Note: Funding to the IAC program is not represented here.

Fiscal Year 1995 Funding Profile



Alternative Fuels Utilization

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Transportation Technologies
Element: Alternative Fuels
B&R Code: EE50

Laboratory Complex

Principal Laboratories: ORNL
Contributing Laboratories: None
Participating Laboratories: ANL, INEL, LLNL, SNL

Mission Activity Description

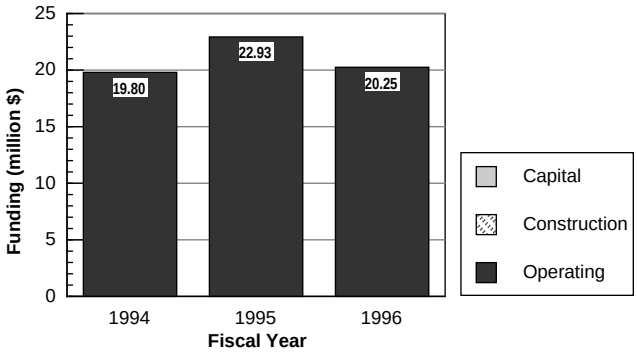
The Alternative Fuels Utilization Program was initiated in the mid-1970s under the authority of the Federal Non-Nuclear Energy Research and Development Act of 1974. The goal of the program was to support research and development activities to promote the use of alternative fuels in the transportation sector. During the first 14 years of this program it received a small amount of funds. The low funding levels allowed the program to maintain a minimal interest in the use of alternative fuels during this period. In 1988 a new piece of legislation, the Alternative Motor Fuels Act of 1988 (AMFA), was passed which strengthened the interest in these fuels by authorizing the Federal Government to demonstrate their use in the Federal fleet. AMFA also put mandates in place for use in Federal, State, and alternative-fuel provider fleets. An out-year conditional mandate was written into the act to allow Congress to require alternative-fuel use in all vehicles, based on information gathered on the Federal experience. In parallel, Congress increased funding levels on alternative-fuels research and development in order to develop the technology to commercially acceptable level. The Energy Policy Act of 1992 strengthened the Federal role by indefinitely extending authority to the Government to promote the widespread use and distribution of alternative fuels. The current program has evolved into three areas of focus:

Engine Optimization—The Engine Optimization subprogram is focused on research and development activities to advance the state of technology in transportation alternative-fuel use.

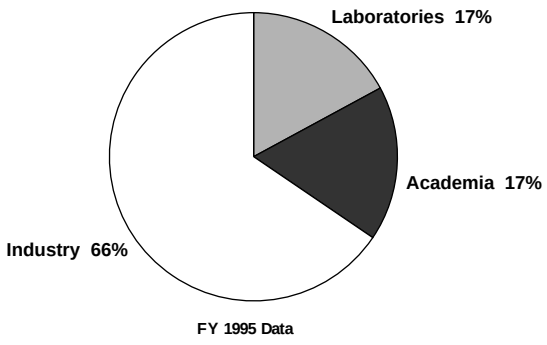
Fleet Test Demonstrations—Demonstration activities are conducted utilizing Federal, municipal, and private fleets. Performance, emissions, and durability data are collected on the alternative-fuel vehicles and compared with their petroleum-fueled counterparts.

Atmospheric Reactions—The objective of the Atmospheric Reactions subprogram is to assess the impact of alternative fuels on urban air quality relative to conventional transportation fuels.

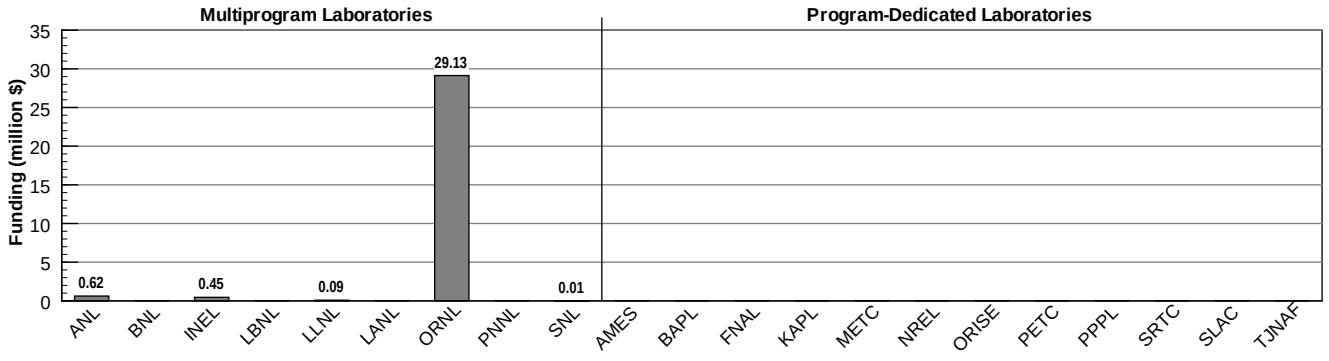
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Materials Technology

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Transportation Technologies
Element: Advanced Transportation Materials
B&R Code: EE51

Laboratory Complex

Principal Laboratories: ORNL
Contributing Laboratories: None
Participating Laboratories: ANL, INEL, LLNL, PNNL, SNL

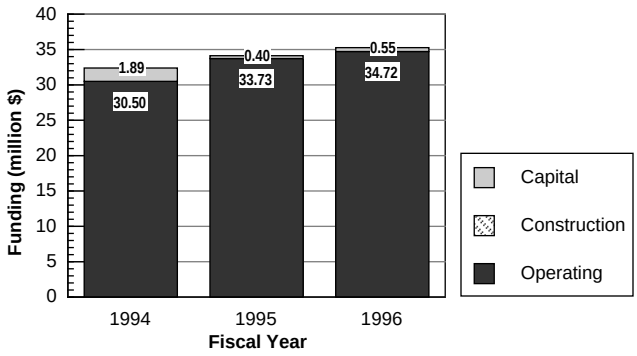
Mission Activity Description

Materials technology is the enabling technology for any conceivable conventional or advanced vehicle to achieve significantly higher fuel efficiency and reduced emissions, two of the Department of Energy's strategic goals. Timely availability of new, advanced materials having superior and reproducible properties and materials manufacturing technologies is critical for the development and engineering of advanced, fuel-efficient transportation systems which will result in the reduction of dependence on foreign petroleum, improving the balance of payments and increasing the gross domestic product, addressing two more strategic goals of the Department of energy. The materials R&D required for transportation vehicles falls into two categories:

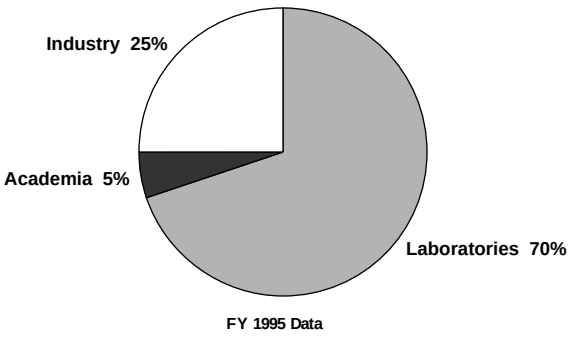
Propulsion System Materials—Ceramics are lighter than metals, can operate at much higher temperatures, and are wear resistant. These properties offer the potential over conventional materials to enable heat engines to operate more efficiently and reduce fuel consumption. The propulsion system materials subprogram supports development of high-temperature and wear-resistant ceramics for heat engine components.

Vehicle System Materials—Lightweight materials such as aluminum and magnesium alloys and polymer composites for vehicle chassis and body components will enable vehicle weight reduction and lead to improved overall fuel economy. The vehicle systems materials subprogram supports development of innovative, cost-effective forming processes for aluminum and magnesium alloys that can be used in domestic automobile production.

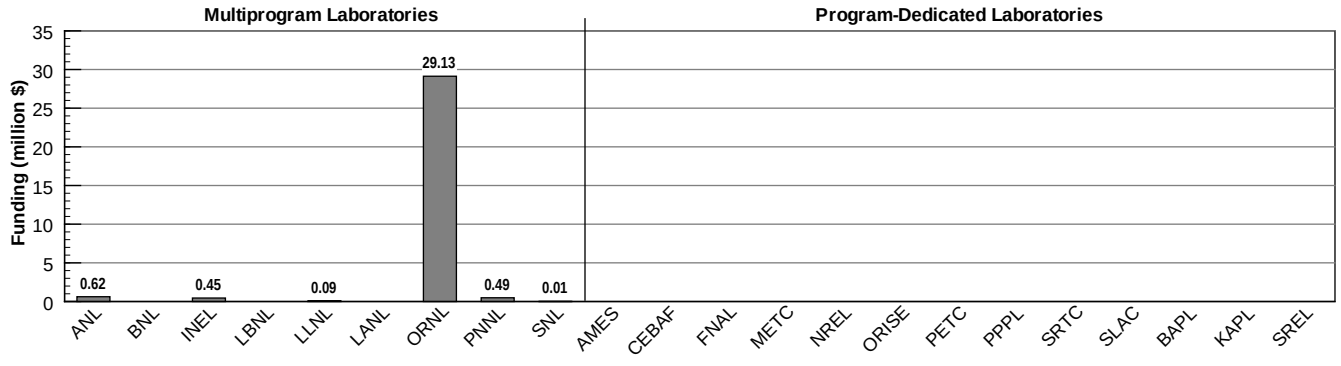
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Heat Engine Development

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Transportation Technologies
Element: Propulsion Systems
B&R Code: EE52

Laboratory Complex

Principal Laboratory: ANL, ORNL, PNNL, SNL
Contributing Laboratories: INEL, ORNL
Participating Laboratories: LANL, LLNL

Mission Activity Description

The Heat Engine Development activity is responsible for assisting industry and supporting government laboratory and university research in the development of advanced heat engine propulsion systems for highway vehicles. Development and commercialization of powertrain technology will assist the U.S. auto industry in meeting the upcoming statutory emission standards with improved fuel efficiency and in regaining market share lost to foreign competitors.

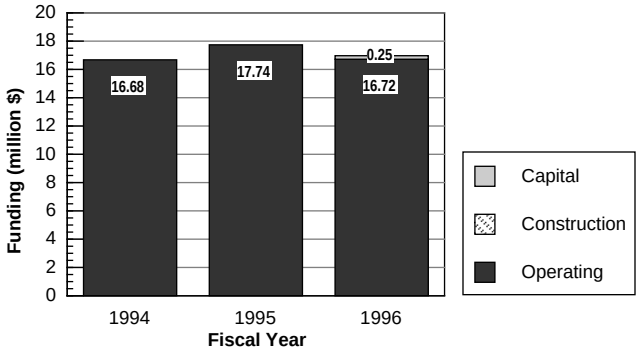
Turbine Engine Technologies—This subprogram supports the development of advanced technologies applicable to high-efficiency, ultra-low-emission, multifuel capable, turbo-alternator integrated power units for evaluation and possible future production of hybrid vehicles. This program is directed with the assistance of the NASA Lewis Research Center.

Automotive Piston Engine Technologies—Since its inception in FY 1994, the Automotive Piston Engine Technologies (APET) subprogram has provided a formal mechanism through which DOE-sponsored, conventional engine research and development (R&D) fulfills the requirements of the Energy Policy Act of 1992 (section 2022). APET also directly supports the goals of the Partnership for a New Generation of Vehicles Program by assisting the U.S. auto industry in cost-effectively meeting upcoming statutory emission standards without penalizing fuel efficiency.

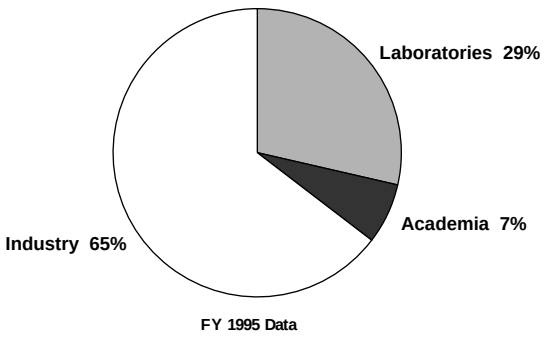
Combustion and Emissions Applied R&D—As a crosscutting effort, the Combustion and Emissions Applied Research and Development subprogram supports engine technology development efforts that are aimed at improving fuel efficiency, emissions reduction, and alternative fuel capability.

Heavy Duty (Diesel) Engine Technologies—R&D is carried out to accelerate the ability of the U.S. diesel engine manufacturers to meet Environmental Protection Agency 1998 and proposed future emission regulations, while ensuring the availability of viable technology to achieve improved efficiency in diesel engines with conventional and alternative fuel capability.

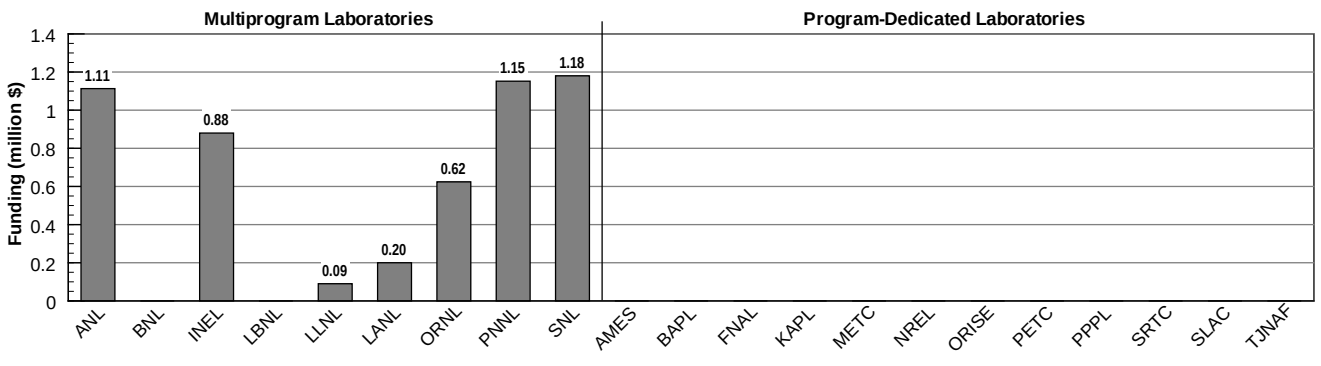
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Electric and Hybrid Propulsion Development

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Transportation Technologies
Element: Electric/Hybrid Propulsion
B&R Code: EE53

Laboratory Complex

Principal Laboratories: NREL, INEL
Contributing Laboratories: ANL, LBNL
Participating Laboratories: BNL, LLNL, ORNL, SNL

Mission Activity Description

The Electric and Hybrid Propulsion Development activity focuses on transportation technologies that will reduce our Nation's dependence on imported petroleum and improve the air quality in our urban areas. The program is concentrating on electric vehicles, fuel-cell-powered vehicles, and hybrid systems that utilize an electric drive in combination with a more conventional propulsion system. The work is cost shared with the automobile manufacturers and their supply industry. The Electric and Hybrid Propulsion Development Program consists of the four areas of activity described below.

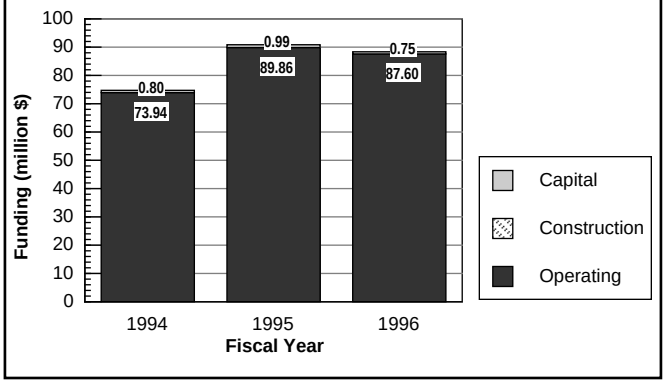
Electric Vehicle Research and Development—The Electric Vehicle Research and Development (R&D) subprogram supports the development of advanced electrochemical energy storage technologies that are required for the successful commercialization and broad public acceptance of electric vehicles as a transportation alternative to conventional internal combustion engine vehicles.

Hybrid Vehicle Research and Development—The Hybrid Vehicle R&D subprogram was initiated in FY 1993 as a 5-year, cost-shared cooperative effort with teams from General Motors and Ford. The primary objective is to complete the development of a production-feasible propulsion system by 1998.

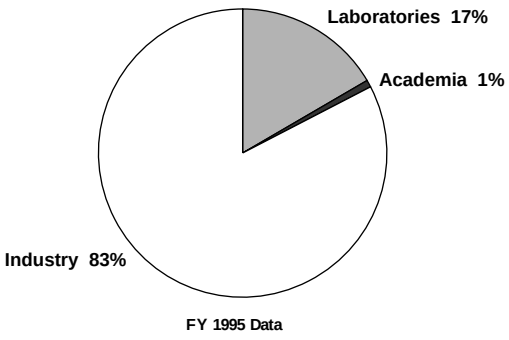
Fuel Cell Research and Development—The Fuel Cell R&D subprogram provides for the development of fuel cell propulsion systems as an alternative to internal combustion engines for the U.S. transportation sector.

Exploratory Technology Research—Exploratory technology research includes research on advanced batteries, ultracapacitors, and fuel cells for electric and hybrid-vehicle applications.

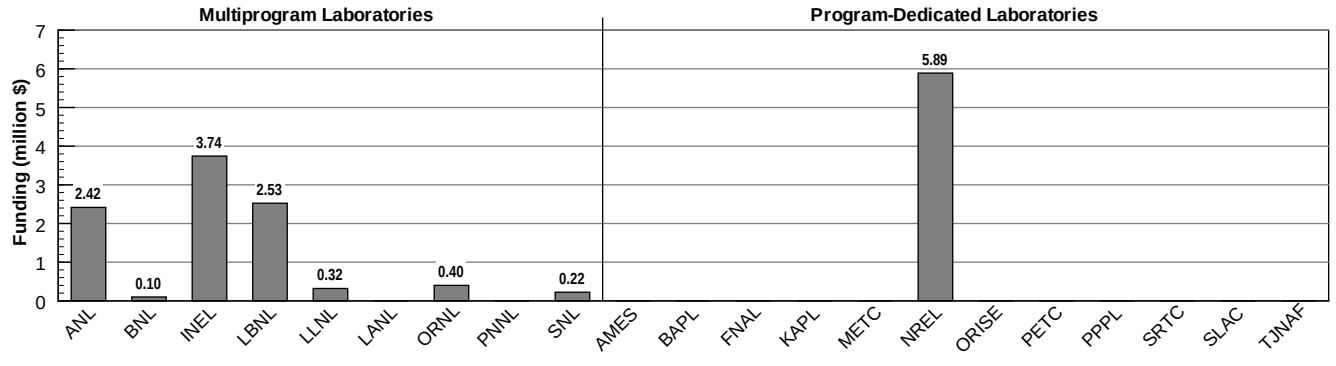
Funding History



Laboratory-Academia-Industry Participation



Fiscal Year 1995 Funding Profile



Transportation Technologies Implementation and Deployment

Department of Energy Program

Program: Energy Efficiency and Renewable Energy
Office: Transportation Technologies
Element: Transportation Technologies
B&R Code: EE54

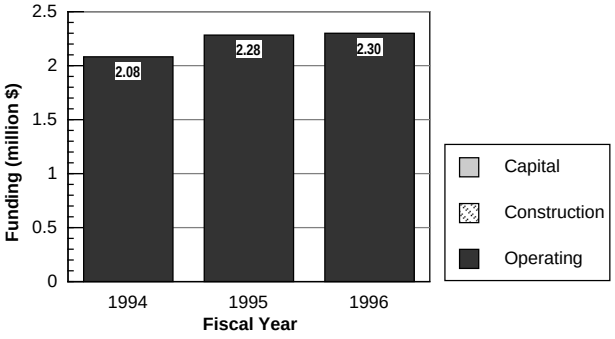
Laboratory Complex

Principal Laboratories: ANL
Contributing Laboratories: ORNL
Participating Laboratories: NREL

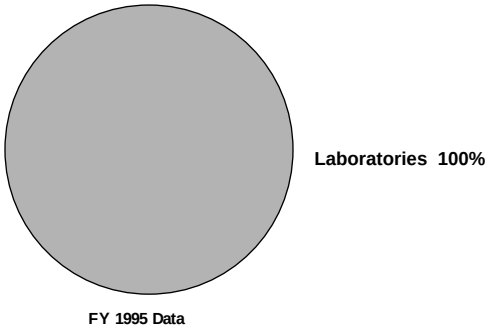
Mission Activity Description

The Implementation and Deployment activity develops and uses analytic tools to estimate the oil saving potential and social benefits of improved transportation technologies. This includes the characterization of technologies (cost and performance), the market potential of technologies, the resulting oil displacement, the emission reductions (both ambient and global), and the economic impacts (changes in employment and gross domestic product). Technology costs are estimated using program estimates, technical literature, cost accounting experts, and delphi studies. The market penetration is determined by using a vehicle choice model based on stated-preference data. The economic impacts are estimated by using a macroeconomic input-output model. A transportation energy data book is also produced each year for use by program managers, contractors, and other interested analysts.

Funding History



Laboratory-Academia-Industry Participation



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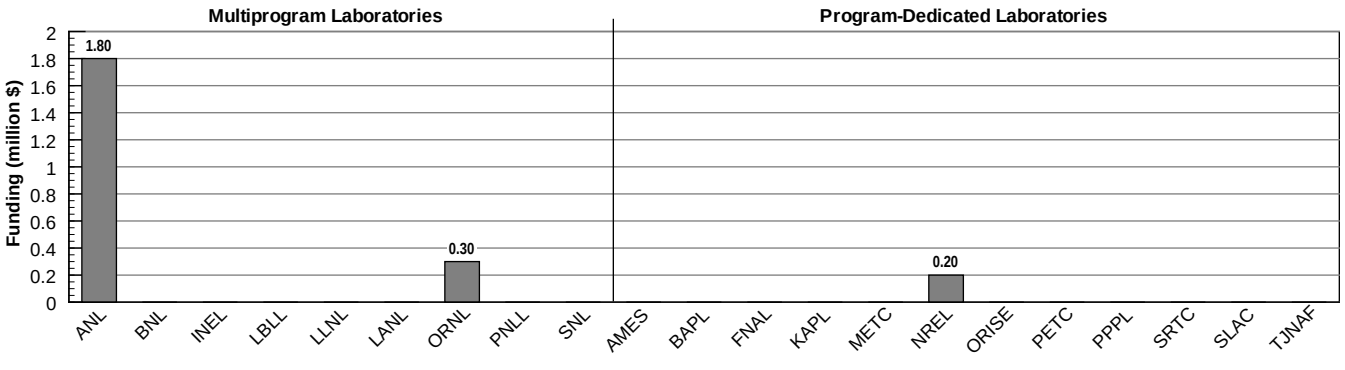


Policy Planning and Analysis and Country Analyses

Department of Energy Program

Program: Policy
Office: Policy Planning and Analysis and Country Analyses
Element: Policy Planning and Analysis and Country Analyses
B&R Code: PE

Laboratory Complex

Principal Laboratories: None
Contributing Laboratories: None
Participating Laboratories: All

Mission Activity Description

Policy studies are conducted within the Office of Policy and its subordinate organizational elements. These studies and analyses serve a variety of cross-cutting Departmental functions.

Energy Policy—Analyze and recommend policy on economic, technical, environmental, and regulatory aspects of alternative fuels, oil, gas, renewables, energy efficiency, electric power generation, and energy utilization.

Economic and Environmental Policy—Analyze the economic and environmental impacts of various energy and related policies; perform studies on the energy-related aspects of global climate change and sustainable development; develop, maintain and refine various analytical information, data, tools and predictive models of energy and economic trends and activities that affect national energy supply, demand, and prices.

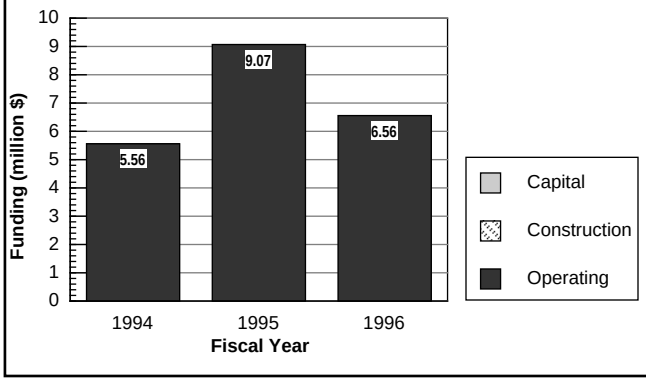
International Energy Policy—Direct and coordinate Departmental relations with other nations and with international organizations; monitor and analyze world energy market developments and the international, economic, political and strategic factors that affect those markets.

Science and Technology Policy—Analyze, develop and recommend crosscutting science and technology policies affecting Departmental activities in basic research; energy and related environmental technology research and development (R&D); export market analysis and development; and the national laboratories. Develop, maintain, and refine data and analytical tools to support science policy analysis

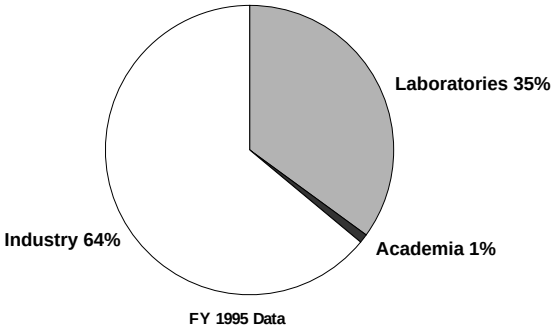
National Security and Environmental Restoration Policy—Formulate and recommend policies for DOE's defense, environmental restoration, safety and health, and emergency planning; analyze economic, financial, trade, and institutional factors that affect national security and related matters.

Strategic Planning and Programming—Develop, implement, and manage departmentwide strategic and multiyear planning; provide indepth technical and policy evaluation of the Department's program and budget priorities.

Funding History

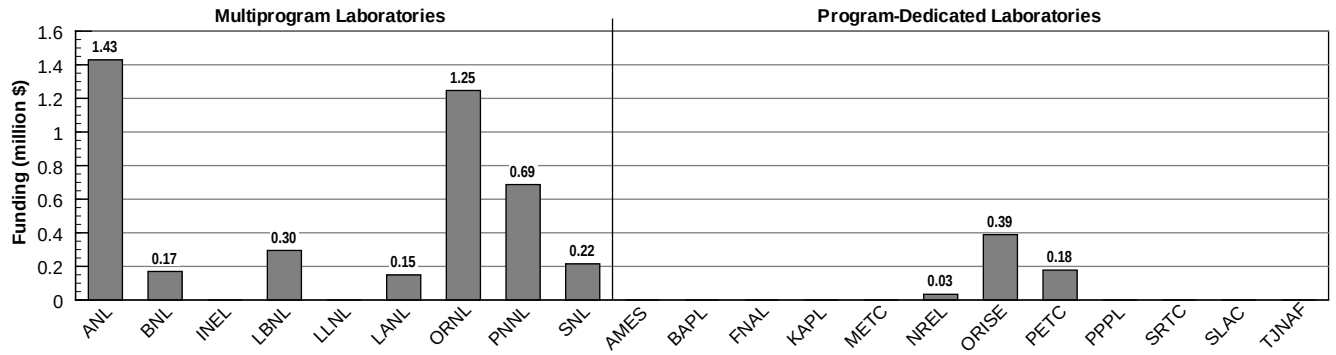


Laboratory-Academia-Industry Participation



Note: Industry partition includes NAS, trade associations, and so forth.

Fiscal Year 1995 Funding Profile



Note: The DOE laboratories are utilized on an "as-needed" basis. Therefore all DOE laboratories are considered participating laboratories.